Macro-Disagreement Beta*

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Abstract

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Keywords: Disagreement, heterogeneous beliefs, speculation, asset pricing

JEL Classifications: G10, G12, G13, F37

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1 Introduction

Much progress has been made in the last few decades in analyzing the role of disagreement (or heterogeneous beliefs) in financial markets; see Basak (2005), Hong and Stein (2007), and Xiong (2013) for excellent surveys. In fact, Hong and Stein (2007) advocate that the disagreement models "represent the best horse on which to bet..., if behavioral finance will have to move beyond being a large collection of empirical facts and competing one-off models, and ultimately reach a similar sort of consensus" as classical asset pricing.

Somewhat surprisingly, however, the literature has largely overlooked a basic economic effect of disagreement: When two investors agree to disagree on future prospects of the market and trade with each other accordingly, they *both* expect to profit at the expense of their trading partners. All else being equal, the larger the belief dispersion, the higher the perceived future trading profits. Hence, disagreement is a state variable positively linked to investors' perceived future profit opportunity, and *disagreement beta*, the covariance between an asset's return and the magnitude of the disagreement on the economy, should price cross-sectional asset returns. To the best of our knowledge, this basic asset pricing effect of disagreement has not been examined in the literature.

To formalize this intuition, we construct a stylized model, in which two (groups of) investors agree to disagree about the future of the economy. Hence, they speculate with each other, and both believe that they can profit from their trades. Naturally, the model shows that, everything else being equal, periods with large disagreement are "good times," i.e., both investors expects high future trading profits.[1] Consequently, an asset with a high disagreement beta tends to do well during "good times" but poorly during "bad times," and hence commands a high expected return in equilibrium.

The main contribution of the paper is to empirically investigate the effect of disagree-

[1]It is worth emphasizing that our interpretation of high disagreement periods as "good times" is conditional on everything else being equal. In particular, as shown in summary statistics of Section 2, disagreement is usually negatively correlated with market return. A stressful time of the economy is hence a "bad time" in terms of the aggregate market risk. But it is a "good time" regarding the potential trading profits (both groups of) investors expect to achieve, fixing the market risk.

ment beta on cross-sectional returns. We first construct a disagreement measure on the U.S. macroeconomic fundamentals using professional forecasts data. We then regress an asset's excess returns on this U.S. macro disagreement variable to obtain, what we call, "macro-disagreement beta." Consistent with the above intuition, our empirical analysis documents a strong positive relation between macro-disagreement betas and asset returns in the cross section across a variety of important U.S. asset markets, including individual stocks, corporate bonds, and mortgage-backed securities.

Specifically, to construct the U.S. macro-disagreement measure, we use monthly professional forecasts of key variables about the U.S. economy – real GDP growth (RGDP), industrial production growth (IP), unemployment rate (UNEMP), and nonresidential investment (INV) – from July 1984 to December 2014.[2] These forecast data are obtained from the Blue Chip Economic Indicators (BCEI) survey of market participants' expectations.[3] It contains individual forecasts from about 50 professional economists in leading financial institutions each month. For each of the four variables in each month, we measure its disagreement as the cross-sectional standard deviation of individual forecasts. We then use the simple average of these four disagreement variables as our *macro-disagreement measure*. This measure usually spikes up during significant events, such as the 9/11 terrorist attack in 2001, and the 2007-2008 global financial crisis.

It is worth mentioning that one distinctive feature of the BCEI forecasts is their availability at the monthly frequency. Consequently, we are able to conduct disagreement beta estimation at the monthly frequency, which we expect to be more accurate than the estimation at lower frequencies such as quarterly and semi-annually using other survey data, e.g., the Survey of Professional Forecasters (SPF) and Livingston Survey of the Federal Reserve Bank of Philadelphia. In particular, to estimate the macro-disagreement beta of each asset,

[2]In robustness checks, we construct alternative disagreement measures based on more or fewer U.S. macro variables, and find similar results.

[3]A recent literature including Greenwood and Shleifer (2014), Amromin and Sharpe, and Bacchetta et al. (2009) uses the survey forecasts of asset returns to study the formation of return expectations of economic agents.

we regress its monthly excess returns on the change of macro-disagreement measure, controlling for the market factor and the forecast consensus, using the past 36-month observations. Then, within the sample of each asset class, we sort assets into portfolios based on their macro-disagreement betas and examine their future returns.

We find strong and consistent evidence on the positive relationship between an asset's expected return and its macro-disagreement beta in a variety of U.S. asset markets, including individual stocks, corporate bonds, and mortgage-backed securities. Among U.S. individual stocks, for example, the return spreads between the top and bottom deciles are 0.45% ($t = 3.89$) and 0.81% ($t = 3.71$) per month for equal-weighted and value-weighted portfolios, respectively. Among 16 U.S. corporate bond return indices, the return difference between the top and bottom quartiles is 0.24% per month (with a t-statistic of 1.84). Among 21 mortgage-backed security and asset-backed security return indices, the return difference is 0.22% per month (with a t-statistic of 2.04). The return spread is even stronger, about 0.36% per month with a t-statistic of 2.88, when we form portfolios across the two sets of fixed-income asset return indices (i.e., corporate bonds as well as mortgage-backed and asset-backed securities) to increase the number of assets in each quartile.

The return spread between the top and bottom portfolios remains significant after controlling for a large number of factors. For individual stocks, for instance, under the Fama-French-Carhart-four-factor adjustment, the equal-weighted portfolio alpha is 0.40% per month ($t = 3.15$) and value-weighted portfolio alpha remains at 0.77% per month ($t = 2.93$). For corporate bond and mortgage-backed securities, after adjusting for the long-term corporate bond excess return factor of Asvanunt and Richardson (2015), and the value and momentum factors of Asness et al. (2013) in the bond market, the long-short returns remain similar and significant. In particular, the macro-disagreement beta long-short portfolio across all fixed-income assets has an alpha of about 0.34% per month with a t-statistic about 2.71.

We further investigate three important aspects of the working mechanism of disagreement-beta effect. First, as illustrated in our stylized model, the disagreement beta effect does not

depend on short-sale constraints; instead, short selling is important for pessimists to realize their perceived trading profits. Consequently, the mechanism of disagreement beta effect is distinctive from those based on disagreement and short-sales constraint. One such well-known mechanism is that short-sale constraints make a stock's price reflect the valuations of optimists rather than pessimists, leading to a negative relationship between disagreement on individual stocks and their future returns (Miller (1977), Chen et al. (2002), Diether et al. (2002), Hong and Stein (2003), and Yu (2011).[4] To empirically distinguish our mechanism from the disagreement effect due to short-sales constraints on individual assets, we construct double-sorting portfolios for U.S. individual stocks, for which stock level disagreement measures can be constructed. Within each quartile portfolio based on the stock level disagreement, we sort assets by our macro-disagreement measure, and find the long-short disagreement beta portfolio returns range from 0.33% to 0.47% per month with t-statistics from 2.64 to 3.77. Fama-MacBeth regressions also confirm the significance of macro-disagreement beta in explaining cross-sectional stock returns after controlling for individual stock disagreement.

Second, the disagreement-beta effect arises from the positive effect of disagreement on economic agents' *perceived* trading profits. Hence, the mechanism of disagreement-beta effect is distinctive from those based on the impact of *realized* trading profits and losses on the economic agents' wealth. One such well-documented mechanism is disagreement-induced volatility. Specifically, variations of disagreement over time can lead to endogenous wealth fluctuations of economic agents and variations of market volatility, after shocks are realized and trading profits/losses occurred (Dumas et al. (2009), Xiong and Yan (2010), and Xiong (2013)). To distinguish the disagreement-beta effect from the effect of disagreement-induced volatility, we note that the latter mechanism entails a negative effect of disagreement beta on

[4]Most recently, Hong and Sraer and Hong et al. (2016) show that this mechanism can lead to a flat security market line and a flat yield curve, respectively. Li (2015) further extends the logic in Hong and Sraer to show that stocks with higher macro risk betas earn lower future returns following high macro disagreement states. Moreover, Stambaugh et al. (2012) and Cen et al. studies the role of investor sentiment and underreaction to earnings news, respectively, in cross-sectional stock returns when the heterogeneous belief and short-sale constraint are present.

cross-sectional asset returns. High volatility-beta assets tend to do well when there is high volatility (induced by disagreement), which represents a bad state of the economy, and hence have *low* expected returns in equilibrium. Therefore, the significant positive relationship between our estimated betas and asset returns is *opposite* to the interpretation that macro-disagreement beta effect is driven by disagreement-induced volatility. That being said, we explicitly control for the volatility beta effects using the VIX. Results from both double-sorting portfolio analysis and Fama-MacBeth regressions show that the positive relation between macro-disagreement beta and asset returns remains economically and statistically significant after controlling for volatility beta. Moreover, given that volatility is closely related to economic uncertainty, we also control for the uncertainty factors of Jurado et al. (2015) and Baker et al. (2015), and find similar robustness.[5]

Third, for economic agents to treat high disagreement as representing high perceived trading profits, they need be able to conduct the relevant and potential *trading*, which is more likely to happen in asset markets more closely associated with the underlying fundamentals they disagree about. Consequently, the disagreement beta effect should be revealed more strongly in asset markets that are more likely to host disagreement-induced trading. Given that our disagreement measure is about U.S. macroeconomic fundamentals, we expect the disagreement-beta effect to be stronger for U.S. asset markets than for international markets that might be less integrated with U.S. macro fundamentals. We hence conduct placebo tests using international equity indices, sovereign bond futures, and currencies. We find that the macro-disagreement beta has marginal power for explaining cross-sectional returns among international equity indices, with a monthly return spread of 0.19% ($t = 1.31$), but no power for sovereign bond futures and currencies at all. This is consistent with the fact that the mean correlation of international equity index returns with the market return is

[5]Another reason of controlling for uncertainty factors is that forecast dispersion is sometimes used as a proxy of uncertainty in some macro-finance studies (Zarnowitz and Lambros (1987), Bomberger (1996), Giordani and Soderlind (2003), Anderson et al. (2009), Bali et al. (2015), and Della Corte and Krecetovs (2015)). The motivation is that economic agents are likely to disagree with each other when they are uncertain about the economic state.

about 60% while those of sovereign bond futures and currencies are only 16% and -12%, respectively, suggesting the latter two asset markets are much less integrated with U.S. macroeconomic fundamentals.[6] Therefore, the placebo tests provide collaborative evidence that high disagreement represents "good times" because of the perceived profit opportunities arising from the heterogeneous beliefs.

We also conduct a battery of robustness checks. For example, we repeat the portfolio sorting exercises based on the betas with respect to the disagreement on each of the four macro variables – RGDP, IP, UNEMP, and INV – used in the baseline analysis. We still find positive significant relationship between macro-disagreement beta and asset returns mostly, though each of the four disagreement measures shows some weaker explanatory power in certain (but different) asset classes, perhaps because each variable reflects only part of the overall U.S. macro fundamentals. Moreover, a macro-disagreement measure using a larger set of macro variables, including consumer price index and pre-tax corporate profits in addition to RGDP, IP, UNEMP, and INV, delivers similar explanatory power as in our baseline results. We also construct the macro-disagreement measure alternatively using the first principal component (rather than simple average), the AR(1) residual (rather than the first-order difference), or the top-minus-bottom-ten average (rather than the cross-sectional standard deviation) of individual forecasts, and find similar results. Finally, we show that the explanatory power of macro-disagreement for asset returns is largely persistent at the quarterly, semi-annual, and even annual portfolio holding horizons.

The literature of disagreement or heterogeneous beliefs in financial markets is vast and still growing. Our paper mainly adds to the studies of the effect of disagreement on asset risk premia. General theoretical works include Miller (1977), Jarrow (1980), Detemple and Murthy (1994), Zapatero (1998), Basak (2000), Jouini and Napp (2007), Gallmeyer and Hollifield (2008), Atmaz and Basak (2015), Bhamra and Uppal (2014), and Chabakauri

[6]In untabulated results, we find the macro-disagreement beta estimated with respect to the level, rather than change, of macro-disagreement variable has better explanatory power for these international asset markets, but the overall significance is yet as strong as for U.S. markets.

(2015), among others, with or without frictions. Recent works use disagreement models to conduct in-depth analysis of risk premia in specific markets, such as Buraschi and Jiltsov (2006) and Buraschi et al. (2014b) in equity options markets, Xiong and Yan (2010), Bali et al. (2011a), Buraschi et al. (2014a), Carlin et al. (2014), Ehling et al. (2015), and Giacoletti et al. (2015) in fixed-income markets, and Beber et al. (2010) in currency markets, in addition to those cited above on U.S. stocks. Moroever, Dieckmann (2011), Chen et al. (2012), and Piatti (2015) study heterogeneous beliefs on disaster risks.[7] Distinct from all these studies, our paper is the first to document the important cross-sectional asset pricing implication of *disagreement beta*, arising from the effect of disagreement on investors' perceived trading profits.

The rest of the paper is organized as follows. Section 2 motivates our empirical tests by analyzing a simple model. Section 3 introduces the data and macro-disagreement measure, while Section 4 provides our main empirical findings. Section 5 conducts robust analysis. Section 6 concludes. The appendix provides proofs.

2 A Simple Model

We consider a two-period model, with time $t = 0, 1, 2$. The state of the economy is denoted by a variable S, whose value will be realized at $t = 2$. For simplicity, we assume that S has two possible values, 0 and 1.

There is a continuum of investors with a total population size of 2. They are ex ante identical: All of them have the same endowment W_0 at $t = 0$. They share the same belief about a random variable Δ, which has a uniform distribution on $[0, 0.5)$ and whose value will be realized at $t = 1$. The interpretation of Δ is as follows. At $t = 1$, each investor, with a

[7]To name a few other applications in financial markets, Harrison and Kreps (1978), Scheinkman and Xiong (2003), and Hong et al. (2006) analyze the role of disagreement on financial bubble. Trading and volatility with heterogeneous beliefs are studied in Harris and Raviv (1993), Kandel and Pearson (1995), David (2008), Cao and Ou-Yang (2009), Dumas et al. (2009), Banerjee and Kremer (2010), and Daniel et al. (2015). Baker et al. (2016) studies the effect of financial speculation induced by disagreement on real investment, Simsek (2013) and Shen et al. (2014) investigate financial innovations, and Blume and Easley (2006), Kogan et al. (2006), and Yan (2008) consider natural selection of heterogeneous agents.

50% probability, becomes one of the two types. Each investor's type is drawn independently. Hence, the population size of each type is 1. The two types of investors agree to disagree on the distribution of S. Type 1 investors's belief is given by

$$S = \begin{cases} 1 & \text{with a probability of } 0.5 + \Delta, \\ 0 & \text{with a probability of } 0.5 - \Delta, \end{cases}$$

while type-2 investors belief is

$$S = \begin{cases} 1 & \text{with a probability of } 0.5 - \Delta, \\ 0 & \text{with a probability of } 0.5 + \Delta. \end{cases}$$

That is, Δ measures the disagreement between the two types of investors at $t = 1$.[8] The larger the value Δ, the stronger the disagreement.

Investors have access to a risk-free asset and the interest rate is 0 for both periods. At $t = 1$, investors can also speculate on the state of the economy by trading a zero-net supply "security a," which pays one unit of consumption at $t = 2$ if $S = 1$, and 0 otherwise.[9] The price of this security at $t = 1$ is denoted as P_a, and will be determined in equilibrium.

Our goal is to analyze the cross-sectional asset returns from $t = 0$ to $t = 1$. We introduce N assets. For $j = 1, ..., N$, "asset j" is a claim to a dividend D_j at $t = 1$. The distributions of the dividends will be specified later. For simplicity, we assume that the aggregate supply of asset j is 0. The price of asset j at $t = 0$ is denoted as P_j, and is determined in equilibrium. All investors are price takers and consume all their wealth at $t = 2$.

At $t = 1$, after investors' types are realized, a type-i investor's (for $i = 1, 2$) objective is to choose their consumption c_1^i, hold θ_i units of security a and invest the rest of his wealth

[8]The symmetry between the two beliefs is assumed to simplify the calculate. Our main results do not depend on this simplification.

[9]The role of this market is to allow investors to speculate on the state of the economy. The equilibrium results remain unchanged if we introduce any other securities at $t = 1$ as long as they are different from the risk-free asset.

in the risk-free asset to

$$\max_{c_1^i,\theta_i} u(c_1^i) + E_1^i\left[u(W_2^i)\right], \tag{1}$$

where $E_1^i[\cdot]$ denotes a type-i investor's expectation conditional on the information at $t=1$, W_2^i is a type i investor's wealth at $t=2$, $u(\cdot)$ is the investor's utility function

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma}, \qquad \text{with } \gamma > 1,$$

where γ is the relative risk aversion. We focus on the case of $\gamma > 1$, as most estimates in the literature suggest that its value is larger than 1 (see, for example Cohen and Einav (2007) and the references therein).[10]

At $t=0$, each investor's objective is to choose his consumption c_0, investment in the N assets and the risk-free asset to

$$\max u(c_0) + E_0\left[V^i(W_1^i)\right], \tag{2}$$

where $E_0[\cdot]$ denotes the investor's expectation conditional on the information at $t=0$, and $V^i(W_1^i) \equiv \max u(c_1^i) + E_1^i[u(W_2^i)]$ is the value function of a type-i investor, and W_1^i is the investor's wealth at $t=1$.

The equilibrium is P_a, P_j for $j=1,...,N$, and all investors' consumption and investment decisions, such that investors maximize their expected utility (1) and (2), and all markets clear, i.e., the aggregate demand is 0 for security a, and for each of the N assets.

We construct the equilibrium in two steps. We first construct the equilibrium at $t=1$, taking investors' wealth W_1^i as given. It formalizes the intuition that when the two types of investors disagree more, they all believe their investment are more profitable. In the second step, we construct the equilibrium at $t=0$ to demonstrate the effect of the disagreement beta on cross-sectional asset returns.

[10] As is known since Merton (1973) and Campbell (1993), the risk premium induced by hedging demand disappears for the log case ($\gamma = 1$), and changes sign when γ becomes smaller than 1.

2.1 Disagreement and Perceived Profit Opportunity

Since all investors are ex ante identical, they have the same wealth at $t = 1$, that is, $W_1^1 = W_1^2$. So we can drop the superscript to use W_1 to denote the investor's wealth. The following proposition characterizes the equilibrium prices and investors consumption decision.

Proposition 1 *At $t = 1$, the price of security a is given by*

$$P_a = \frac{1}{2}. \tag{3}$$

Type-1 investors long θ units of security a and type-2 ones short θ units, where

$$\theta = W_1 \frac{(1+2\Delta)^{1/\gamma} - (1-2\Delta)^{1/\gamma}}{2 + (1+2\Delta)^{1/\gamma} + (1-2\Delta)^{1/\gamma}}. \tag{4}$$

Both types of investors consume the same amount

$$c_1^1 = c_1^2 = \frac{2W_1}{2 + (1+2\Delta)^{1/\gamma} + (1-2\Delta)^{1/\gamma}}. \tag{5}$$

This proposition highlights the intuition that when the magnitude of the disagreement among investors increases, they *all* find their opportunity improves. This is illustrated in equation (3): From a type-1 investor's perspective, the expected return of security a is 2Δ.[11] Similarly, a type-2 investor believes that the expected return of security a is -2Δ. Note from (4) that type-1 investors long the security while type-2 investors short. Hence, for both types, the expected return from their positions in security a is 2Δ, that is, when the belief dispersion Δ increases, both types of investors expect their trades to be more profitable.

Intuitively, with disagreement, both types' of investors believe that they will make profits at the expense of their counterparty. The larger the disagreement, the more the investors think they are taking advantage of their trading counterparty, and expect higher profits. Since disagreement affects investors' perceived opportunity, it naturally affects investors'

[11] Investor 1's expected return is given by $\frac{(0.5+\Delta)\times 1 + (0.5-\Delta)\times 0}{1/2} - 1 = 2\Delta$.

consumption and investment choices. For instance, equation (4) shows that investors' bet more when there is more disagreement (i.e., θ is increasing in Δ). Due to the symmetry in our setup, both investors have the same consumption at $t = 1$ (equation (5)). Simple differentiation of (5) shows that c_1^i is increasing in Δ, that is, both types of investors consume more when their perceived investment opportunity becomes more profitable.

2.2 Disagreement Beta and Expected Returns

To analyze the equilibrium at $t = 0$, we first note that investors are identical at this stage and hence they have zero holdings in all the N assets and have the same consumption c_0. Moreover, as noted in equation (5), both investors have the same consumption at $t = 1$. Hence, we can simply use c_1 to denote all investors' consumption at $t = 1$, and the price of asset i at $t = 0$ is given by

$$P_i = E_0 \left[\frac{u'(c_1)}{u'(c_0)} D_i \right]. \tag{6}$$

To analyze the effect of the disagreement beta, we rewrite the dividend of asset i as

$$D_i = \bar{D}_i + \beta_i \left(\Delta - \bar{\Delta} \right) + \epsilon_i, \tag{7}$$

where $\bar{D}_i$ and $\bar{\Delta}$ are the expected values of D_i and Δ, respectively, β_i is the "disagreement beta" of asset i, and ϵ_i is the residual that has a mean of zero, a finite variance, and is independent of Δ. Denote the return of asset i as

$$r_i \equiv \frac{D_i}{P_i} - 1.$$

Substituting (6) into the above expression, we obtain the following proposition.

Proposition 2 *An asset's expected return is increasing in its disagreement beta:* $\frac{\partial E[r_i]}{\partial \beta_i} > 0$

This proposition shows that there is a positive relation between an asset's expected return and its disagreement beta. The intuition is as follows. A high disagreement-beta asset tends

to perform poorly when there is less disagreement, which is a "bad time" because, as noted in Proposition 1, this is when investors expect low future returns, consume less, and have a high marginal utility. Therefore, an asset with a higher disagreement beta has a higher expected return in equilibrium.

2.3 Empirical Implications

Although being fairly simplified, the model introduced above illustrates several key aspects of the disagreement-beta effect on asset returns that can be tested empirically. In this section, we discuss these implications and potential issues to account for in empirical testing, as exemplified by the model.

First of all, the key implication, as shown in Proposition 2, is that disagreement beta affects asset returns positively. This will be the main hypothesis we test using portfolio analysis based on estimates of the disagreement beta. However, as illustrated in the model, this key implication stems from that high disagreement standing for a "good time" to (both optimistic and pessimistic) investors, conditional on the market risk. That is, everything else being equal, disagreement makes a separate state variable that is *positively* related to investors' perceived future profit opportunities. Hence, the disagreement beta should be estimated after controlling for the market beta and forecast consensus beta.

Second, as shown in Proposition 1, for the key mechanism of the disagreement-beta effect – high disagreement standing for a "good time" to both optimistic and pessimistic investors – to hold, short selling cannot be constrained. In fact, it is important for pessimists to be able to conduct short sales in order to realize their perceived trading profits. Consequently, we can empirically distinguish the disagreement-beta effect from those theories that require short-sale constraints. One such theory is that a stock's price only reflects the valuations of optimists rather than pessimists under short-sale constraints, and hence the greater the disagreement on individual stocks, the higher the price of a stock in equilibrium and the lower the subsequent return in the cross section (Miller (1977), Chen et al. (2002), and Diether

et al. (2002)).

Third, high disagreement leads both optimistic and pessimistic investors to expect high *perceived* trading profits. This distinguishes the disagreement-beta effect from those based on the impact of *realized* trading profits and losses on the economic agents' wealth. In particular, a realized positive (negative) shock causes optimists (pessimists) to gain greater wealth, which give them greater weights in determining asset prices. Consequently, variations of disagreement over time lead to endogenous wealth fluctuations of economic agents and variations of market volatility: the larger is disagreement, the higher is market volatility (Dumas et al. (2009), Xiong and Yan (2010), and Xiong (2013)). Such a disagreement-induced volatility chanel entails that disagreement is negatively related to the state of the economy as high volatility periods are "bad times", in contrast to our channel of perceived trading profits, in which disagreement represents a good (subjective) state of the economy, all else being equal. To distinguish the two channels, we can empirically test whether the disagreement-beta effect is robust to the volatility-beta effect.

Finally, for high disagreement to be positively related to investors' perceived profit opportunity, they need be able to *trade* on an asset that allows them to speculate on the state of the economy that they disagree on, i.e., the "security a" in the model. Clearly, this security and its trading are more likely to be in asset markets more closely associated with the underlying fundamentals they disagree about. Naturally, the disagreement-beta effect will be revealed more strongly in asset markets that are more likely to host disagreement-induced trading. Therefore, one implication related to the trading aspect of the disagreement-beta effect we can test is that the effect of disagreement beta on asset returns is stronger (weaker) in markets that are more (less) integrated to the economic fundamentals investors disagree on.

3 Data and Measure

In this section, we first construct the macro-disagreement measure based on Blue Chip monthly surveys of U.S. economic indicators, and then introduce the set of testing assets used in our empirical analysis.

3.1 Macroeconomic Forecast and Disagreement

We use the Blue Chip Economic Indicators (BCEI) survey of market participants' expectations on important U.S. macro variables to construct the macro-disagreement measure. Different from the commonly used macroeconomic forecasts such as the Survey of Professional Forecasters that are available at the quarterly frequency, the BCEI conducts monthly surveys on a variety of U.S. macro variables from a large number of professional economists in leading financial institutions including banks, broker-dealers, and consulting firms. It is usually conducted on the first two business days of each month and published on the tenth. Therefore, the survey results are known by market participants at each month end, which makes monthly portfolio analysis based on the survey implementable.

To construct the macro-disagreement measure parsimoniously, we use forecasts of four fundamental variables about the U.S. economy in our baseline analysis, real GDP growth (RGDP), industrial production growth (IP), unemployment rate (UNEMP), and non-residential fixed investment growth (INV), from July 1984 through December 2014.[12] One nice feature of these macro variables is the unambiguous interpretation that high and low values generally represent upsides and downsides of the economy, different from interest rates and inflation rates for which both high and low values may represent downsides of the economy (see Li and Zhao (2009) for evidence from interest rate derivatives). Nevertheless, we also consider forecasts of additional macro variables including inflation rate in Section 6 for robustness

[12]In addition to these four macro variables, the BCEI survey also includes nominal GDP, GDP Price Index, Consumer Price Index, Disposable Personal Income, Personal Consumption Expenditure, Corporate Profits, 3-Month Treasury Bill Rate, 10-year Treasury Note Rate, Housing Starts, Auto & Light Truck Sales, and Net Exports.

checks.

The BCEI collects forecasts for both the current calendar year and next calendar year. For example, the survey of January 2005 contains forecasts for 2005 and 2006, with forecasting horizons being 12 and 24 months, respectively. However, the survey of February 2005 has one month shorter forecasting horizons, with 11 and 23 months for 2005 and 2006, respectively. This particular data feature of diminishing forecasting horizons from this month to next month generates seasonality for both the raw individual forecasts and any derived measures based on them. We follow the standard procedure of the U.S. Census Bureau in performing an X-12 ARIMA filter on the raw forecast series to remove such seasonality. In addition, forecasts of RGDP, IP, and INV are all on year-on-year percentage changes, while those of UNEMP are on the annual average unemployment rate.

Table 1 reports summary statistics of these forecasts across different forecasters for the current calendar year, including the mean, median, standard deviation (Std. Dev.), minimum (Min), maximum (Max), the first quartile (Q1), the third quartile (Q3), and number of forecasters (N). We calculate the time-series averages of these statistics for both full sample and various sub-samples. On average, there are about 50 professional forecasters in each month. For our interest in forecast dispersion, the forecast standard deviation seems to be lower in recent than in early periods in our sample. Moreover, the mean and median forecasts vary significantly across different time periods.

For each of the four variables in each month, we measure its disagreement as the cross-sectional standard deviation of individual professional forecasts for the current calendar year. Specifically, denote $\xi_{i,t}^k$ as the forecast of a macro variable k, for $k \in \{\text{RGDP, IP, UNEMP, INV}\}$, by individual i in month t. We measure the disagreement on variable k as

$$Disagree_t^k = \sqrt{\frac{1}{N_t^k} \sum_i^{N_t^k} \left(\xi_{i,t}^k - \overline{\xi}_t^k\right)^2},$$

where N_t^k is the number of forecasts on variable k in month t, $\overline{\xi}_t^k = \sum \xi_{i,t}^k / N_t^k$ is the cross-

sectional average of the individual forecasts.

We then use the simple monthly average of these four disagreement variables as our macro-disagreement measure, denoted as $Disagree_t$, in capturing the disagreement on the overall U.S macro fundamentals (we also use the first principal component (PC) based on the correlation matrix that however is subject to look-ahead bias to certain extent). Similarly, we measure the forecast consensus of the U.S. economy, $Consensus_t$, as the monthly average of the cross-sectional median of individual forecasts of RGDP, IP, UNEMP, and INV. Figure 1 plots the monthly time series of the disagreement and consensus measures $Disagree_t^k$ and $Consensus_t^k$ for the four macroeconomic variables as well as the measures $Disagree_t$ and $Consensus_t$ for the overall U.S. economy. We observe that both $Disagree_t$ and $Consensus_t$ vary over time. Furthermore, $Disagree_t$ usually spikes up during significant events, such as the 9/11 terrorist attack in 2001, and the 2007-2008 global financial crisis, and is negatively correlated with $Consensus_t$ (the correlation is -0.36), implying that market participants tend to disagree more when the consensus forecast is low.[13]

3.2 Testing Assets

Our testing assets consist of important U.S. markets, including individual stocks, corporate bonds, and mortgage-backed securities, with summary statistics of monthly excess returns (in excess of the one-month U.S. T-bill rate) reported in Table 2. For most variables, the sample period is July 1984 - December 2014, corresponding to the availability of our BCEI forecast data, but the starting months vary for some assets. We now describe them in order.

The U.S. stock sample contains CRSP common stocks (with share code 10 or 11) from NYSE/Amex/Nasdaq exchanges (with exchange code 1, 2, or 3). Panel A of Table 2 shows that the average monthly return is about 0.68% with positive skewness.

Our U.S. corporate bond sample contains 16 corporate bond return indices from Barclays Capital (via Datastream), with various combinations of credit ratings (e.g., AAA, AA, A,

[13]The increase in disagreement is less obvious during the Asian financial crisis in 1997, which is reasonable as our measure captures disagreement on the U.S. macroeconomy

BAA, High Yield and so on) and maturities (long and intermediate). Panel B of Table 2 presents the list of these indices and their summary statistics in details. On average, the monthly return is 0.43% with negative skewness.

Our U.S. mortgage-backed security (MBS) sample is also from Barclays Capital (via Datastream), with 16 investment grade (with ratings from BBB through AAA) commercial mortgage-backed security return indices of different maturities (1-3.5 years through 8.5 years or more), 4 agency MBS return indices, and one asset-backed security return index. Panel C of Table 2 shows that the monthly average return is 0.31%, and the skewness is mostly negative for CMBS return indices.

4 Disagreement Beta and Asset Returns

In this section, we conduct our empirical tests of the explanatory power of disagreement beta on asset returns. According to the discussions in Section 2.3, we first conduct the baseline portfolio analysis on the key implication – the positive effect of disagreement beta on asset returns – in each of the three U.S. asset markets considered. We then contrast our results with the well-known effect from disagreement with short-sales constraint as well as the disagreement-induced volatility. Finally, we consider markets that are less integrated with the U.S. macro fundamentals.

4.1 Baseline Analysis

Throughout, we estimate each asset's macro-disagreement beta β^d by regressing its monthly excess returns rx_t on the change of macro-disagreement measure $\Delta Disagree_t$ ($=Disagree_t - Disagree_{t-1}$), controlling for the market factor MKT_t (the CRSP value-weighted market excess returns in the U.S. sample) and the change in forecast consensus $\Delta Consensus_t$

$(=Consensus_t - Consensus_{t-1})$:

$$rx_t = \alpha + \beta^d \cdot \Delta Disagree_t + \beta^c \cdot \Delta Consensus_t + \beta^m \cdot MKT + \varepsilon_t$$

In order to obtain time-varying estimates of β^d and other betas, we use standard rolling-window regressions, based on the past 36-month observations, and require at least 24 months of data available to ensure a reasonable number of observations in the estimation. At the end of each month from July 1986 through November 2014, we form 10 decile portfolios for the sample of U.S. individual stocks (CRSP common shares with price between \$5 and \$1,000 at the time of portfolio formation) and four quartile portfolios for the sample of 16 Barclays corporate bond return indices and 21 mortgage-backed security return indices, according to their macro-disagreement betas. For each decile portfolio of U.S. individual stocks, we calculate both equal-weighted (EW) and value-weighted (VW) portfolio returns, while for corporate bonds and MBS, we calculate equal-weighted portfolio returns. We hold the portfolio for a month before rebalancing (We report results of quarterly, semi-annual, and annual holding horizons in Section 6).

The first two columns of Table 3 report the monthly excess returns of macro-disagreement beta portfolios. Low (high) macro-disagreement beta portfolios consist of assets with the lowest (highest) macro-disagreement betas. We also construct long-short zero-cost hedge portfolios by long high macro-disagreement beta stocks and short low macro-disagreement beta stocks. On average, each decile has about 330 stocks, which should diversify idiosyncratic risks well. The equal-weighted low (high) macro-disagreement beta stocks earn 0.44% (0.88%) per month and the return difference is 0.45% per month (with a Newey-West t-statistic of 3.89). The return spread based on value-weighted portfolios is of larger magnitude, at 0.81% per month (with a t-statistic of 3.71). Overall, portfolio results with U.S. individual stocks strongly confirm the positive relationship between macro-disagreement beta and expected stock returns, consistent with our model in Section 2.

The next two columns of Table 3 show that the returns are mostly monotonically increasing in the macro-disagreement beta for both fixed-income markets. For corporate bond return indices, low (high) macro-disagreement beta quartiles earn 0.31% (0.55%) per month, with an return difference of 0.24% per month and a t-statistic of 1.84. For MBS return indices, low (high) macro-disagreement beta portfolios earn 0.15% (0.36%) per month, and the return of high-minus-low macro-disagreement beta portfolio is 0.22% per month with a t-statistic of 2.04. The lower return spread associated with macro-disagreement beta is potentially due to the small number of assets in each quartile portfolio, only about four and five for corporate bonds and MBS, respectively. To increase the testing power, we pool the 37 fixed-income asset return indices together and form four quartile portfolios, with results reported in the last column of Table 3. We observe that both the economic and statistical significances are improved, with the return of high-minus-low macro-disagreement beta portfolio about 0.36% per month with a t-statistic of 2.88, confirming the strong macro-disagreement beta effect in the U.S. fixed-income market as a whole.

Figure 2 plots the distribution of corporate bonds and MBS in the top and bottom macro-disagreement beta quartiles for the U.S. fixed-income market as a whole. At the end of each month, we count the number of corporate bonds (MBS) in quartile 1 and then divide it by the total number of fixed-income assets in quartile 1. Figure 2 shows two patterns. First, for the majority of the sample period, the top and bottom quartiles contain both corporate bonds and MBS, suggesting that the result for the U.S. fixed-income market as a whole is not predominately driven by either of the asset classes. Second, the asset composition of low and high macro-disagreement beta portfolios varies substantially over time, indicating that corporate bond and MBS have time-varying loadings on macro-disagreement. Overall, our empirical evidence implies that return dynamics driven by macro-disagreement beta are indeed pervasive across the U.S. fixed-income market as a whole. [14]

The last row of Table 3 reports the abnormal returns of the high-minus-low macro-

[14]We plot asset distribution starting from 1999 to ensure a reasonable number of MBSs in the sample.

disagreement beta portfolio in different markets. Adjusting for the Fama and French (1993) and Carhart (1997) four factors, the alphas of high-minus-low macro-disagreement beta portfolios of U.S. individual stocks are 0.40% per month ($t = 3.15$) and 0.77% per month ($t = 2.93$) by equal-weighted and value-weighted, respectively. Adjusting for long-term corporate bond excess return factor of Asvanunt and Richardson (2015), and the value and momentum factors of Asness et al. (2013) in the bond market[15], the alphas of high-minus-low macro-disagreement beta portfolios are 0.23% ($t = 1.74$), 0.24% ($t = 2.21$), and 0.34% ($t = 2.71$) for corporate bonds, MBS, and the whole fixed-income market, respectively. Overall, the significant alphas show that the macro-disagreement beta has a strong explanatory power for cross-sectional returns in important U.S. asset markets that is distinct from existing return predictors.

What are the high and low disagreement-beta assets? We report in Table A1 some characteristics of the disagreement-beta sorted portfolios to get a sense of potential sources. For U.S. stock market, higher disagreement-beta stocks have significantly higher book-to-market values, lower investments, and lower net stock issue, but most other characteristics including market value, past returns, profitability, idiosyncratic volatility, co-skewness, and idiosyncratic skewness cannot explain the differences in disagreement betas. Moreover, for U.S. fixed-income markets, we do not observe significant difference in credit rating and maturity between the high and low disagreement-beta portfolios.

4.2 Short-Sale Constraint

As discussed in Section 2.3, allowing short sales is essential for the positive disagreement-beta effect on asset returns because it makes high disagreement a "good time" to pessimistic investors. In this section, we conduct some tests to distinguish the disagreement-beta effect from those theories that require short-sale constraints. One particular theory for disagreement to affect asset returns in the presence of short sales constraints is that a stock's price

[15]We download these factors from the AQR data library.

only reflects the valuations of optimists rather than pessimists under this constraint, and hence the greater the disagreement on individual stocks, the higher the price of a stock in equilibrium and the lower the subsequent returns in the cross section. This effect of individual disagreement was modeled in Miller (1977) and empirically confirmed in Diether et al. (2002), Chen et al. (2002), and so on.

We distinguish the disagreement beta effect from this channel associated with short sales constraints among the U.S. individual stocks, for which the individual disagreement measures can be constructed. In particular, following the literature, we extract financial analyst one-quarter-ahead earnings forecasts from I/B/E/S, and use their cross-sectional standard deviation as the measure of disagreement on individual stocks. We require at least five available forecasts in computing this disagreement measure. We then conduct both double-sorting portfolio analysis and Fama-MacBeth regressions.

Table 4 reports the 4×4 independent-sorting portfolios of U.S. individual stocks based on the disagreement beta and the stock-level disagreement. We observe that there is a strong negative relationship between individual stock disagreement and stock returns in all quartile portfolios of disagreement beta, consistent with the literature. Importantly, we find disagreement beta has a significant positive effect on cross-sectional stock returns in all stock disagreement quartile portfolios. The return spread (Fama-French-Carhart alpha) between the high and low macro-disagreement beta portfolios ranges from 0.33% - 0.47% (0.30% - 0.39%) per month with t-statistics about 2.64 - 3.76 (2.04 - 3.03).

Table 5 further presents results from Fama and MacBeth (1973) regressions of an asset's realized excess returns in month $t+1$ on its macro-disagreement beta and individual disagreement in month t. To reduce estimation errors, we use quintile rankings of disagreement betas in the cross-sectional regressions. The significant positive coefficients on macro-disagreement in a variety of specification further confirm the distinctiveness of the effect of disagreement beta on cross-sectional stock returns relative to the effect of individual disagreement in combination with short-sale constraints. In addition, Table 5 also shows that

the macro-disagreement beta effect is robust to a large set of firm-level characteristics such as the (log) market equity and book-to-market equity (Fama and French (1992)), past 12-month return (Jegadeesh and Titman (1993)), operating profitability and investment (Fama and French (2015)), operating accruals (Sloan (1996)), net stock issuance (Fama and French (2008)), past one-month return (Jegadeesh (1990)), Amihud's illiquidity (Amihud (2002)), idiosyncratic return volatility (Ang et al. (2006)), systematic skewness (Harvey and Siddique (2000)), and idiosyncratic skewness (Bali et al. (2011b)).

4.3 Perceived Profit vs Endogenous Wealth Fluctuation

In this section, we empirically test whether the disagreement-beta effect is driven by the disagreement-induced volatility-beta effect. Both of these effects arise from speculation trading caused by disagreement when short-sale constraints are absent, as discussed in Section 2.3.

First of all, we note that (disagreement-induced) volatility beta should have the *opposite* effect on the expected return to disagreement beta: high volatility-beta assets tend to do well when there is high volatility, which is generally considered to be "bad time". Hence, in equilibrium, high volatility-beta assets should have low expected returns. Therefore, the significant positive relationship between macro-disagreement beta and asset returns we document is *opposite* to the interpretation that macro-disagreement beta effect is driven by disagreement-induced volatility through endogenous wealth fluctuations.

Nevertheless, we explicitly control for assets' volatility betas using VIX as an empirical proxy of volatility. Moreover, given that volatility is closely related to economic uncertainty and survey forecast dispersion has been used as a proxy for uncertainty in some macro-finance studies (Zarnowitz and Lambros (1987), Bomberger (1996), Giordani and Soderlind (2003), Clements (2008), and Baker et al. (2015), Anderson et al. (2009), Bali et al. (2015), and Della Corte and Krecetovs (2015)), we control for two additional volatility/uncertainty factors including the macro uncertainty factor in Jurado et al. (2015) (JLN) and the economic

policy uncertainty (EPU) factor in Baker et al. (2015).[16] We estimate each asset's volatility/uncertainty beta based on the same rolling-window beta estimation procedures as those for the estimation of macro-disagreement betas. We conduct both double-sorting portfolio analysis and Fama-MacBeth regressions to study the robustness of the macro-disagreement beta effect to the volatility/uncertainty beta effect.

Table 6 reports independent double-sorting portfolio results based on the macro-disagreement beta and volatility/uncertainty beta. For U.S. individual stocks, we first form 4×4 independent-sorting portfolios based on macro-disagreement beta and volatility/uncertainty beta and calculate the equal-weighted portfolio returns for these 16 portfolios. Then, for each of the four macro-disagreement beta ranking, we take the average return across the four volatility/uncertainty beta portfolios. This procedure creates a set of macro-disagreement beta quartiles with very similar levels of volatility/uncertainty beta, and hence these macro-disagreement beta quartiles control for differences in volatility/uncertainty beta. The high-minus-low macro-disagreement beta portfolio is the return difference between quartile 4 and quartile 1. Panel A of Table 6 presents the double-sorting results for U.S. individual stocks. Column 1 uses the beta on VIX as volatility beta, while columns 2-3 use the beta on JLN and EPU factors as uncertainty beta, respectively. We observe that macro-disagreement beta has significant positive effect on cross-sectional stock returns after controlling for volatility and uncertainty betas. The return spread (Fama-French-Carhart alpha) between the high and low macro-disagreement beta portfolios ranges from 0.22% - 0.24% (0.22% - 0.25%) per month with t-statistics about 2.75 - 3.22 (2.54 - 2.78).

For U.S. fixed-income assets, we follow a similar procedure. The only difference is that we first form 2×2 independent-sorting portfolios and pool corporate bonds and MBS together to make sure there are enough assets within each portfolio. Then, for each of the two macro-

[16]The motivation is that economic agents are likely to disagree with each other when they are uncertain about the economic state (Bachmann et al. (2013)). In fact, the stock market volatility VIX is used as a market uncertainty measure in Bloom (2009). However, similar to volatility beta, uncertainty beta has the *opposite* effect on the expected return to disagreement beta: high uncertainty-beta assets tend to do well when there is more uncertainty, which is generally considered to be "bad time". Hence, in equilibrium, high uncertainty-beta assets should have low expected returns.

disagreement beta ranking, we take the average return across the two volatility/uncertainty beta portfolios. Panel B of Table 6 reports the results for U.S. fixed-income assets. We observe that macro-disagreement beta has significant positive effect on cross-sectional returns of fixed-income assets after controlling for volatility and uncertainty betas. Both the raw return and alpha (after adjusting for the bond market factor of Asvanunt and Richardson (2015), and the bond value and momentum factors of Asness et al. (2013)) of the high-minus-low macro-disagreement beta portfolio are significantly positive with t-statistics above 2.05.

Table 7 further presents results from Fama and MacBeth (1973) regressions of an asset's realized excess returns in month $t+1$ on its macro-disagreement beta and volatility/uncertainty betas estimated in month t. To make all beta rankings comparable and to reduce estimation errors, we use quintile rankings of volatility/uncertainty beta and macro-disagreement beta for the sample of U.S. individual stocks and fixed-income assets. We observe that these volatility/uncertainty betas are not significantly related to asset returns in most specifications. To the contrary, in all specifications, the macro-disagreement beta has a strong positive relation with asset returns after controlling for volatility and uncertainty betas.[17]

Overall, both double-sorting portfolio results and Fama-MacBeth regressions show that the positive relation between macro-disagreement beta and asset returns remains both economically and statistically significant after controlling for these volatility and uncertainty betas. These results confirm that our disagreement-beta effect due to the *ex-ante* perceived trading profits is indeed distinct from the volatility-beta effect due to the *ex-post* wealth fluctuations.[18]

[17] In unreported analysis, we also control the Fama and French (2015) five factors, the Fama and French (1996) short- and long-term reversal factors, and the Pastor and Stambaugh (2003) liquidity factor. Our macro-disagreement effect is robust to these factors as well.

[18] An auxiliary implication of the robustness to uncertainty betas is that even though forecast dispersion may well be correlated with uncertainty, the disagreement channel dominates in the macroeconomic survey forecast dispersion as far as financial markets are concerned (see D'Amico and Orphanides (2008) and Lahiri and Sheng (2010) for evidence that forecast dispersion does not proxy uncertainty well based on time series analysis of survey data).

4.4 Markets Less Integrated with U.S. Macro Variables

As illustrated in the stylized model of Section 2, the mechanism of the disagreement-beta effect depends on the perceived trading profit opportunities arising from disagreement. Consequently, the effect of macro-disagreement in representing "good times" depends on which asset markets investors trade in to realize the perceived profits against other investors. As our disagreement measure is about U.S. macroeconomic fundamentals, we naturally expect the disagreement-beta effect to be stronger for important U.S. asset markets than for international markets that might be less integrated with U.S. macro fundamentals.

In this section, we conduct placebo tests using monthly return series of international equity indices, sovereign bond futures, and currencies.In particular, the equity index class contains 20 MSCI international equity market indices from Datastream (we use MSCI *investable* market indices once they become available): Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Italy, Ireland, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States. The currency class contains the currencies from 10 developed economies: Australian Dollar, Canadian Dollar, Danish Krone, Euro, Japanese Yen, New Zealand Dollar, Norwegian Krone, Swedish Krona, Swiss Franc, and United Kingdom Pound. We calculate the currency returns using the spot and one-month forward exchange rates from Barclays and Reuters via Datastream. The bond class contains 19 sovereign bond (front-month) futures contracts from various exchanges: Australia 3- and 10-year Treasury Bonds, 10-year Government Bond of Canada, Euro-Bobl, Euro-Schatz, Euro-Bund, Germany 30-year Government Bond, Italy 10-year Government Bond, Japan 10-year Government Bond, Spain 10-year Government Bond, UK 10-year Gilt, US 2-, 5-, 10-, and 30-year Treasury securities, South Korea 3-year Government Bond, New Zealand 10-year and 3-year Government Bond, and Switzerland 10-year Government Bond.

Table 8 shows that macro-disagreement beta has marginal power for explaining cross-sectional returns among international equity indices, with a monthly return spread of 0.19% ($t = 1.31$), but no power for sovereign bond futures and currencies at all. This is consistent

with the fact that the mean correlation of international equity index returns with the U.S. market return is about 60% while those of sovereign bond futures and currencies are only 16% and -12%, respectively, suggesting the latter two asset markets are much less integrated with U.S. macroeconomic fundamentals. Overall, the placebo tests provide collaborative evidence for the working mechanism of the disagreement-beta effect: High disagreement represents "good times" because of the perceived profit opportunities arising from the heterogeneous beliefs. Accordingly, we find the disagreement-beta effect on U.S. macro fundamentals are revealed more strongly in asset markets that are more integrated to the U.S. macro variables.

5 Robustness

In this section, we conduct a number of robustness checks of the macro-disagreement beta effect on cross-sectional asset returns.

First, note that our baseline analysis uses professional forecasts on RGDP, IP, UNEMP, and INV to construct the macro-disagreement measure in order to parsimoniously capture the disagreement on U.S. macro fundamentals. Panel A of Table 9 repeats our baseline portfolio analysis based on the betas with respect to each of the four disagreement measures separately. To keep it comparable to the baseline analysis, we form decile portfolios for the U.S. common stock sample and quartile portfolios for fixed-income assets. For brevity, we only present results for the highest and lowest macro-disagreement beta portfolios as well as the long-short hedge portfolios. We observe positive relationship between macro-disagreement beta and asset returns mostly, though some of the individual disagreement measures shows some weaker explanatory power in certain (but different) asset classes.

For example, the betas with respect to the disagreement on IP have significant explanatory power for both U.S. individual stocks and fixed-income assets. The beta with respect to RGDP and INV are significantly positively related to cross-sectional stock returns, while the disagreement beta on UNEMP has some weak explanatory power for fixed-income assets.

These results suggest that using four rather than just one macro variable eliminates certain noises and captures the common variation in the disagreement on U.S. macro fundamentals. Panel B of Table 9 repeats our baseline analysis based on the betas with respect to a larger set of macro variables, including consumer price index (CPI) and pre-tax corporate profits (CORP) in addition to RGDP, IP, UNEMP, and INV. The results are similar to those in our baseline analysis. But the return spread and t-statistics are smaller for all assets. Overall, these results suggest that our baseline macro-disagreement measure does a reasonable job in parsimoniously capturing the overall disagreement on U.S. macroeconomic fundamentals, and excluding unnecessary noises in the data at the same time.

Second, we conduct our tests based on alternative constructions of the macro-disagreement measure. In this part, we still use the four macro variables in the baseline analysis. The first alternative measure uses the top-minus-bottom-ten average forecasts (rather than the cross-sectional standard deviation) in month t as $Disagree_t$. Specifically, in each month and for each macro variable, we sort all individual analysts' forecasts from low to high, calculate the average over the bottom ten forecasts and the average over the top ten forecasts. Disagreement is measured by the difference between these two averages. The second alternative measure uses the AR(1) residual (rather than the first-order difference, $\Delta Disagree_t$) as the shock to disagreement. The third alternative measure uses the first principal component (rather than the simple average) as $Disagree_t$. Table 10 reports the portfolio results based on betas with respect to these alternative macro-disagreement measures. The results remain similar to those in the baseline analysis. In particular, the high-minus-low macro-disagreement beta portfolios for individual stocks significantly earn 0.40% to 0.88% with t-statistics larger than 2.79. The high-minus-low macro-disagreement beta portfolios for fixed income assets also earn 0.30% to 0.36% with t-statistics over 1.80 for these alternative macro-disagreement measures.

Third, Table 11 reports macro-disagreement beta portfolios for U.S. individual stocks that are "industry-neutral" to account for the well-documented industry effects in U.S. cross-

sectional stock returns. Specifically, we first group stocks into the Fama-French 12-industry classification according to their Standard Industry Classification (SIC) codes. Then, for each industry, we form ten decile portfolios based on macro-disagreement beta. Finally, for $i = 1, ...10$, we combine the ith decile portfolios across the 12 industries to form an industry neutral decile-i portfolio. We hold the portfolio for a month before rebalancing. We report the monthly excess returns of industry-neutral macro-disagreement beta portfolios. Low (high) macro-disagreement beta portfolios consist of assets with the lowest (highest) macro-disagreement betas. We also construct long-short zero-cost hedge portfolios by long high macro-disagreement beta stocks and short low macro-disagreement beta stocks. On average, each decile has about 330 stocks, which should diversify idiosyncratic risks well. The equal-weighted low (high) macro-disagreement beta stocks earn 0.48% (0.87%) per month and the return difference is 0.39% per month (with a Newey-West t-statistic of 3.89). The return spread based on value-weighted portfolios is of a larger magnitude, at 0.758% per month (with a t-statistic of 3.96). Overall, portfolio results with U.S. individual stocks confirm the positive relationship between macro-disagreement beta and expected stock returns.

Finally, we examine portfolio returns at various holding horizons. Table 12 shows that the macro-disagreement beta effect is not short-lived. High macro-disagreement beta assets earn high returns in the cross section at the quarterly, semi-annual, and even annual portfolio holding horizons. For U.S. individual stocks, the equal-weighted high-minus-low macro-disagreement beta portfolios significantly earn 0.48%, 0.42%, and 0.33% per month with t-statistics of 3.39, 3.61, and 2.88 at the quarterly, semi-annual, and annual portfolio holding horizons, respectively. The return spread based on value-weighted deciles is of a larger magnitude. High-minus-low macro-disagreement beta portfolios significantly earn 0.80%, 0.71%, and 0.52% per month with t-statistics of 3.32, 3.09, and 2.27 at the quarterly, semi-annual, and annual portfolio holding horizons, respectively. The results for U.S. fixed-income assets shows similar pattern. The return spreads between the high and low macro-disagreement beta quartiles are 0.40%, 0.42%, and 0.48% per month with t-statistics

of 2.88, 2.59, and 2.83 at the quarterly, semi-annual, and annual portfolio holding horizons, respectively. Correspondingly, Table A2 in the appendix exhibits average portfolio transition probability in one, three, six, and twelve months ahead. All the diagonal elements of the transition matrix are higher than 10% for individual stocks (higher than 25% for fixed income assets) even after twelve months, indicating that macro-disagreement beta is highly persistent. Overall, macro-disagreement beta is a persistent measure for both U.S. individual stocks and fixed-income assets, and have long-lasting effect on subsequent returns.

6 Conclusion

A basic asset pricing implication of disagreement, which has been overlooked in the literature somehow, arises from the fact that when two investors agree to disagree on the future prospects of the market and trade accordingly, they *both* expect to profit at the expense of their trading partners. Consequently, the magnitude of disagreement is positively related to perceived future profit opportunity. Therefore, an asset with high disagreement-beta should deliver high expected return in the cross section.

We construct a macro-disagreement measure based on professional forecasts of the U.S. economy, and document a strong positive effect of macro-disagreement beta on cross-sectional asset returns in a variety of important U.S. asset markets, including U.S. individual stocks, corporate bonds, and mortgage-backed securities. We also distinguish the disagreement-beta effect that does not require short-sale constraint from the effect of individual stock disagreement in combination with short sale constraints. We further show that the disagreement-beta effect is robust to disagreement-induced volatility. Finally, placebo tests with international asset markets deliver suggestive evidence on the importance of perceived trading profit in working mechanism of macro-disagreement beta effect.

How will investors holding different beliefs learn from their speculation profits and losses after the economic state is realized? What will be the dynamics of the perceived trading

profits in dynamic equilibrium models? How will such dynamics affect the pricing effect of disagreement beta in the cross sectional of asset returns? Recent theoretical works such as Banerjee (2011) , Banerjee and Kremer (2010), and Kyle et al. (2016) have proposed several models that can be potentially used to study these issues. Deriving and testing asset pricing implications of disagreement-beta in dynamic settings can be important directions for future research.

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Appendix: Proof of Propositions 1–2

By no arbitrage, the price of the other Arrow security, which pays one unit of consumption at $S = 0$, is $1 - P_a$. Due to the symmetry, the two Arrow securities have the same price, leading to (3).

At $t = 2$, type-1 investors' wealth is $W_1 - c_1^1 - P_a\theta + \theta$ in the case of $S = 1$, and is $W_1 - c_1^1 - P_a\theta$ in the case of $S = 0$. Substituting (3) into these expressions, we can rewrite type-1 investors' objective function as

$$\max_{c_1^1,\theta} u(c_1^1) + (0.5 + \Delta)\, u(W_1 - c_1^1 + \frac{1}{2}\theta) + (0.5 - \Delta)\, u(W_1 - c_1^1 - \frac{1}{2}\theta).$$

The first order conditions are

$$\begin{aligned} u'(c_1^1) = (0.5 + \Delta)\, u'(W_1 - c_1^1 + \frac{1}{2}\theta) \quad &+ \quad (0.5 - \Delta)\, u'(W_1 - c_1^1 - \frac{1}{2}\theta), \\ (0.5 + \Delta)\, u'(W_1 - c_1^1 + \frac{1}{2}\theta) \quad &= \quad (0.5 - \Delta)\, u'(W_1 - c_1^1 - \frac{1}{2}\theta). \end{aligned}$$

From the above equations, we obtain (4) and (5).

Substituting (7) into (6), we obtain

$$P_i = \bar{D}_i + \frac{\beta_i}{u'(c_0)} E_0 \left[u'(c_1) \left(\Delta - \bar{\Delta} \right) \right].$$

Substituting (5) into the above equation, we obtain

$$P_i = \bar{D}_i + \frac{\beta_i}{u'(c_0)\,(W_0 - c_0)^\gamma} E_0 \left[\left(1 + \frac{1}{2}\,(1 + 2\Delta)^{1/\gamma} + \frac{1}{2}\,(1 - 2\Delta)^{1/\gamma} \right)^\gamma \left(\Delta - \bar{\Delta} \right) \right].$$

From the above equation, we obtain $\frac{\partial P_i}{\partial \beta_i} < 0$, which implies $\frac{\partial E[r_i]}{\partial \beta_i} > 0$.

Figure 1: Time series of macro forecast disagreement and consensus

This figure plots monthly time series of the forecast disagreement and consensus measures on real GDP growth (RGDP), industrial production growth (IP), unemployment rate (UNEMP), and non-residential investment growth (INV). The raw forecast series are from the Blue Chip surveys of economic indicators (BCEI), and the sample period is July 1984 - December 2014. We collect individual forecasts from about 50 professional forecasters on average, and follow the standard procedure of the U.S. Census Bureau in performing X-12 ARIMA seasonal adjustment on raw forecast series. The forecast disagreement is estimated as the cross-sectional standard deviation of individual forecasts (with the scale on the right axis), while the forecast consensus is the median (with the scale on the left axis). We report both the individual forecast consensus and disagreement measures on the four macro variables as well as the average of consensus and disagreement of the four macro variables. The last sub-figure reports the first order difference (change) in the average consensus and disagreement.

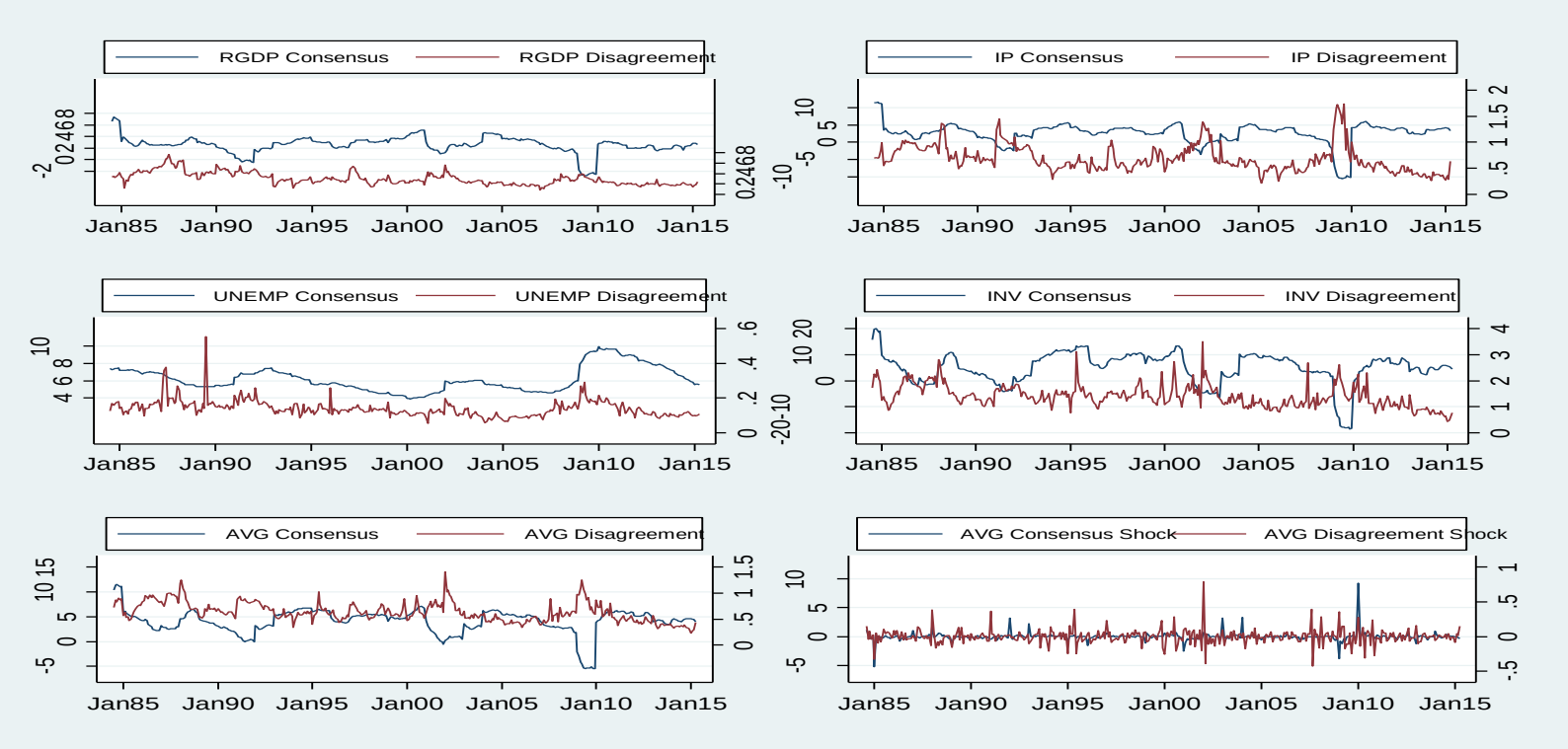

Figure 2: Asset composition in the top and bottom quartile for fixed-income assets

This figure plots monthly time series of the composition of corporate bonds and MBSs in the top and bottom macro-disagreement beta quartiles for the U.S. fixed-income market as a whole. The upper panel shows the asset composition in the low macro-disagreement quartile. At the end of each month, we count the number of corporate bonds (MBS) in quartile 1 and then divide it by the total number of fixed-income assets in quartile 1. The percentage value for each asset class is shown on the vertical axis. The lower panel shows the asset composition in the high macro-disagreement quartile, and the asset composition is calculate in the same method. The time series start from 1999 to ensure an adequate number of MBSs in sample.

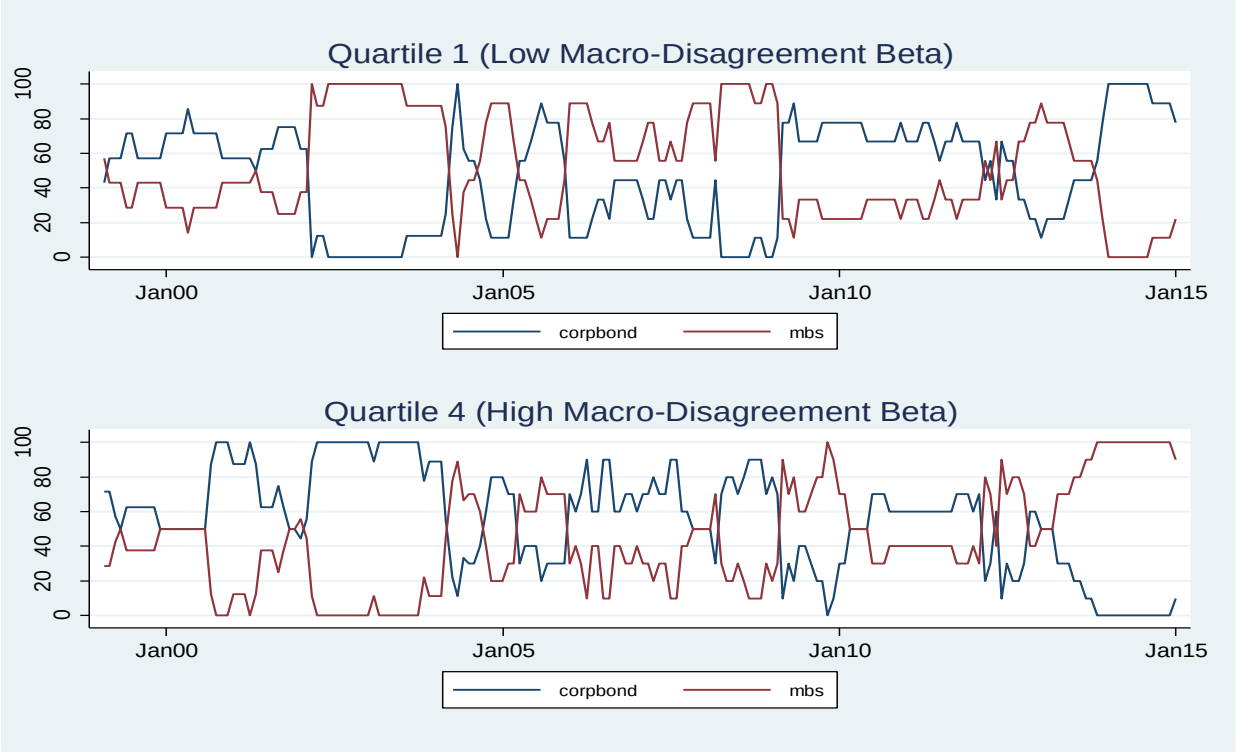

Table 1: Summary statistics of BCEI macroeconomic forecasts

At the beginning of each month from July 1984 through December 2014, we obtain individual analysts' macro forecasts from the Blue Chip surveys of economic indicators (BCEI), including the year-over-year real GDP growth, industrial production growth, real non-residential fixed investment growth, and annual average unemployment rate. After seasonal adjustment for these forecast series, we monthly calculate descriptive statistics of forecast distribution over cross-sectional analysts' forecasts, including mean, median, standard deviation (Std. Dev.), minimum (Min), maximum (Max), the first quartile (Q1), the third quartile (Q3), and the number of forecasts (N). The table presents time-series average of these statistics for both full sample and various sub-samples.

	Mean	Median	Std. Dev.	Min	Q1	Q3	Max	N
A: Real GDP growth (RGDP)								
Full Sample	2.57	2.58	0.30	1.66	2.41	2.74	3.32	52
1984:07-1989:12	3.21	3.24	0.44	1.65	3.02	3.46	4.16	50
1990:01-1999:12	2.49	2.49	0.32	1.49	2.32	2.66	3.29	51
2000:01-2009:12	2.41	2.42	0.26	1.76	2.26	2.57	3.11	52
2010:01-2014:12	2.35	2.35	0.21	1.82	2.23	2.47	2.88	53
B: Industrial production growth (IP)								
Full Sample	2.56	2.54	0.69	0.74	2.20	2.93	4.44	51
1984:07-1989:12	3.85	3.89	0.83	1.23	3.48	4.31	5.86	50
1990:01-1999:12	2.70	2.64	0.68	1.02	2.31	3.05	4.62	51
2000:01-2009:12	1.06	1.04	0.73	-0.71	0.67	1.44	3.21	52
2010:01-2014:12	3.87	3.88	0.48	2.53	3.61	4.17	4.98	52
C: Unemployment rate (UNEMP)								
Full Sample	6.20	6.19	0.14	5.86	6.12	6.28	6.58	51
1984:07-1989:12	6.44	6.43	0.17	6.09	6.34	6.52	7.04	50
1990:01-1999:12	5.79	5.79	0.15	5.40	5.70	5.87	6.16	51
2000:01-2009:12	5.50	5.50	0.12	5.21	5.42	5.57	5.81	52
2010:01-2014:12	8.15	8.15	0.13	7.81	8.08	8.23	8.47	53
D: Non-residential fixed investment (INV)								
Full Sample	4.89	4.90	1.42	1.02	4.12	5.66	8.62	51
1984:07-1989:12	5.47	5.47	1.72	0.70	4.56	6.41	9.69	50
1990:01-1999:12	6.41	6.48	1.46	2.38	5.63	7.27	9.92	51
2000:01-2009:12	2.74	2.72	1.38	-1.17	2.00	3.49	6.25	51
2010:01-2014:12	5.49	5.44	1.09	3.05	4.88	5.99	9.57	53

Table 2: Summary statistics of asset returns

This table presents summary statistics of monthly excess returns (in excess of the one-month US T-bill rate) for US common stocks (Panel A), 16 Barclays' US corporate bond indices (Panel B), 21 Barclays' mortgage-backed security indices (Panel C). The US common stocks are from CRSP and the Barclays credit market indices are from Datastream. The return sample periods various in assets and the earliest begin date of asset return is July 1984 (corresponding to the date when BCEI monthly forecast data become available). For each asset, we calculate time-series statistics of return mean, standard deviation, skewness and kurtosis. We also report the overall statistics across assets at the end of each panel.

Panel A: US equity market

	Begin Date	End Date	Mean	Std. Dev.	Skewness	Kurtosis
US individual stocks	7/31/1984	12/31/2014	0.68%	0.138	1.812	51.816

Panel B: US corporate bond indices (from Barclays Capital)

	Begin Date	End Date	Mean	Std. Dev.	Skewness	Kurtosis
US AGG CORP A INTERMEDIATE	7/31/1984	12/31/2014	0.32%	0.013	-1.467	12.803
US AGG CORP A LONG	7/31/1984	12/31/2014	0.49%	0.025	0.053	5.568
US AGG CORP AA INTERMEDIAT	7/31/1984	12/31/2014	0.30%	0.011	-0.376	3.464
US AGG CORP AA LONG	7/31/1984	12/31/2014	0.52%	0.025	0.572	5.419
US AGG CORP AAA INTERMEDIA	7/31/1984	12/31/2014	0.29%	0.011	-0.699	5.893
US CORP : AAA LONG	7/31/1984	12/31/2014	0.45%	0.028	-0.278	9.817
US AGG CORP BAA INTERMEDIA	7/31/1984	12/31/2014	0.36%	0.013	-1.119	9.349
US AGG CORP BAA LONG	7/31/1984	12/31/2014	0.55%	0.024	-0.441	4.927
CORPORATE A+	7/31/1984	12/31/2014	0.38%	0.015	-0.211	2.771
CORPORATE ENHANCED BB	5/31/1993	12/31/2014	0.47%	0.020	-1.328	11.456
US HIGH YIELD B	7/31/1984	12/31/2014	0.43%	0.025	-0.808	6.874
US HIGH YIELD BA	7/31/1984	12/31/2014	0.52%	0.019	-1.460	10.733
US HIGH YIELD CAA	7/31/1984	12/31/2014	0.36%	0.039	-0.430	6.851
US HIGH YIELD CA TO D	1/29/1993	12/31/2014	0.57%	0.079	2.976	32.625
US HY YIELD 2% ISSUER CAP	1/29/1993	12/31/2014	0.45%	0.025	-1.069	9.954
US HY BA/B 1% ISSUER CAP	1/29/1993	12/31/2014	0.43%	0.022	-1.372	11.739
			0.43%	0.025	-0.466	9.390

Panel C: US mortgage-backed security indices (from Barclays Capital)

	Begin Date	End Date	Mean	Std. Dev.	Skewness	Kurtosis
CMBS INVT GRADE A 1-3.5Y	6/28/2002	12/31/2014	0.51%	0.017	-3.380	27.832
CMBS INVT GRADE A 3.5-6Y	12/31/1999	12/31/2014	0.33%	0.033	-6.904	70.227
CMBS INVT GRADE A 6-8.5Y Y	6/30/1997	12/31/2014	0.21%	0.051	-6.602	66.826
CMBS INVT GRADE A 8.5+Y	1/31/1997	12/31/2014	0.08%	0.055	-4.693	43.973
CMBS INVT GRADE AA 1-3.5Y	10/31/2001	12/31/2014	0.41%	0.013	-3.193	25.860
CMBS INVT GRADE AA 3.5-6Y	4/30/1999	12/31/2014	0.34%	0.028	-6.408	63.042
CMBS INVT GRADE AA 6-8.5Y	1/31/1997	12/31/2014	0.22%	0.048	-7.159	74.934
CMBS INVT GRADE AA 8.5+Y	1/31/1997	12/31/2014	0.00%	0.051	-7.067	70.995
CMBS INVT GRADE AAA 1-3.5Y	4/30/1997	12/31/2014	0.27%	0.010	-1.048	21.042
CMBS INVT GRADE AAA 3.5-6Y	1/31/1997	12/31/2014	0.37%	0.020	0.683	29.487
CMBS INVT GRADE AAA 6-8.5Y	1/31/1997	12/31/2014	0.45%	0.034	0.082	25.579
CMBS INVT GRADE AAA 8.5+Y	1/31/1997	12/31/2014	0.37%	0.041	-0.909	24.497
CMBS INVT GRADE BBB 1-3.5Y	6/28/2002	12/31/2014	0.61%	0.024	-4.377	38.667

CMBS INVT GRADE BBB 3.5-6Y	12/31/1999	12/31/2014	0.44%	0.039	-5.711	56.214
CMBS INVT GRADE BBB 6-8.5Y	6/30/1997	12/31/2014	0.31%	0.052	-4.550	40.255
CMBS INVT GRADE BBB 8.5+	1/31/1997	12/31/2014	0.11%	0.052	-3.638	24.967
FHLMC 15Y	8/30/1985	12/31/2014	0.24%	0.009	-0.083	1.533
FNMA 15Y	8/30/1985	12/31/2014	0.25%	0.009	-0.070	1.339
FNMA 30Y	7/31/1984	12/31/2014	0.35%	0.010	0.210	2.442
GNMA 30 YEARS	7/31/1984	12/31/2014	0.35%	0.011	0.257	2.849
ASSET BACKED SECS	1/31/1992	12/31/2014	0.20%	0.010	0.530	14.215
			0.31%	0.029	-3.049	34.608

Table 3: Monthly returns of macro-disagreement β portfolios

This table presents monthly mean excess returns (in percent) and Newey-West *t* -statistics (in parentheses) of portfolios formed on macro-disagreement β in U.S. individual stocks, 16 Barclays corporate bond return indices, and 21 mortgage-backed security return indices. A security's macro-disagreement β is obtained by monthly regressing its excess returns on the change in macro-disagreement measure Δ*Disagree* , controlling for the market factor and change in macro forecast consensus Δ*Consensus* . We use 36-month rolling-window regressions and require 24 months of observations for performing the estimation. We construct 10 decile portfolios for U.S. stocks and four quartile portfolios for corporate bonds, MBS, and all fixed-income assets combining both (All Fixed Income). We hold the portfolios for a month and calculate both equal-weighted (EW) and value-weighted (VW) portfolio returns for U.S. stocks but only EW portfolio returns for fixed-income markets. The first portfolio formation months are 07/1986, 07/1986, and 07/1987, respectively, within individual stocks, corporate bonds and MBS markets, while the last portfolio formation month is 11/2014 for all. We also report abnormal returns adjusted for the Fama and French (1993) and Carhart (1997) four factors (FFC4) for individual stocks and adjusting for long-term corporate bond excess return factor of Asvanunt and Richardson (2015), and the value and momentum factors of Asness, Moskowitz, and Pedersen (2013) in the bond market (VAL and MOM), obtained from the AQR data library.

Macro-Disagreement β portfolio	US Stocks EW	US Stocks VW	Macro-Disageement β portfolio	Corporate Bond	MBS	All Fixed Income
1(Low)	0.436	0.272	1(Low)	0.306	0.145	0.132
	(1.209)	(0.722)		(2.078)	(0.840)	(0.823)
2	0.701	0.323				
	(2.520)	(1.025)				
3	0.753	0.581				
	(2.966)	(2.303)				
4	0.746	0.595	2	0.255	0.238	0.297
	(2.870)	(2.506)		(2.687)	(2.099)	(3.105)
5	0.764	0.637				
	(3.011)	(2.797)				
6	0.805	0.774				
	(3.321)	(3.093)				
7	0.838	0.655	3	0.386	0.356	0.364
	(3.342)	(2.523)		(3.893)	(4.253)	(4.800)
8	0.809	0.753				
	(3.011)	(3.158)				
9	0.907	0.782				
	(3.311)	(2.624)				
10(High)	0.883	1.079	4	0.55	0.363	0.491
	(2.604)	(2.988)		(4.514)	(2.971)	(4.507)
High-Low	0.447***	0.807***	High-Low	0.244*	0.218**	0.359***
	(3.890)	(3.713)		(1.839)	(2.036)	(2.875)
FFC4 Alpha	0.402***	0.773***	VAL and MOM Alpha	0.231*	0.244**	0.342***
	(3.154)	(2.929)		(1.739)	(2.209)	(2.713)

Table 4: Double-sorting portfolios based on macro-disagreement β and stock-level disagreement

This table reports independent double-sorting portfolio results based on the macro-disagreement beta and stock-level disagreement. We extract financial analyst one-quarter-ahead earnings forecasts from I/B/E/S, and use their cross-sectional standard deviation as the measure of disagreement on individual stocks. At least five available forecasts are required in computing this disagreement measure. Stocks are sorted independently into 4 by 4 portfolios based on macro-disagreement beta and stock-level disagreement and equal-weighted returns are reported for each portfolio. The last column presents the return differences between the high and low stock-level disagreement quartile within each macro-disagreement beta quartile. The last four rows present the return spreads between the high and low macro-disagreement beta quartile within each stock-level disagreement quartile as well as the four factors (FFC4) alphas of these return spreads. Newey-West *t* -statistics are reported in parentheses.

	Stock Disagreement 1 (low)	2	3	Stock Disagreement 4 (high)	Stock Disagreement 4-1
Macro-Disagreement β 1 (low)	1.052	0.679	0.436	0.174	-0.879***
	(3.592)	(2.305)	(1.415)	(0.493)	(-5.829)
2	1.08	0.835	0.672	0.388	-0.691***
	(4.351)	(3.488)	(2.653)	(1.309)	(-4.950)
3	1.1	0.944	0.844	0.59	-0.510***
	(4.446)	(3.866)	(3.367)	(2.069)	(-3.894)
Macro-Disagreement β 4 (high)	1.466	1.006	0.902	0.534	-0.932***
	(5.131)	(3.530)	(2.867)	(1.595)	(-5.664)
Macro-Disagreement β 4-1	0.414***	0.327***	0.466***	0.361***	-0.053
	(3.524)	(2.642)	(3.765)	(2.674)	(-0.324)
FFC4 Alpha	0.354***	0.302**	0.393***	0.351**	-0.003
	(2.847)	(2.322)	(3.031)	(2.044)	(-0.017)

Table 5: Fama-MacBeth Regressions Controlling for Stock-Level Disagreement and Other Characteristics

This table presents results on Fama-MacBeth (1973) regressions of U.S. common stocks' realized excess returns in month t+1 on their macro-disagreement betas, controlling for firm-level characteristics as of month t. We use the quintile ranking of the macro-disagreement beta in these regressions to reduce estimation errors. Firm characteristic variables include I/B/E/S consensus and dispersion for one-quarter ahead earnings forecasts, (log) market equity and book-to-market equity (Fama and French, 1992), past 12-month return (Jegadeesh and Titman, 1993), operating profitability and investment (Fama and French, 2015), operating accruals (Sloan, 1996), net stock issuance (Fama and French, 2008), past one-month return (Jegadeesh, 1990), Amihud's illiquidity (Amihud, 2002), idiosyncratic return volatility (Ang et al., 2006), systematic skewness (Harvey and Siddique, 2000), and idiosyncratic skewness (Bali, Cakici, and Whitelaw, 2011). Intercepts are included in regressions but not reported. Regression coefficients are reported in percentage and Newey-West (1987) t-statistics are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)
Macro-Disagreement β	0.072***		0.117***	0.081***	0.071***
	(3.256)		(4.784)	(3.821)	(3.326)
Stock-Level Disagreement		-0.118	-0.112	-0.163**	-0.178*
		(-1.291)	(-1.236)	(-1.970)	(-1.815)
Stock-Level Consensus		-0.004	-0.006	0.002	-0.033
		(-0.154)	(-0.201)	(0.093)	(-1.031)
Log(Market Equity)				-0.035	-0.090**
				(-0.867)	(-2.113)
Log(B/M Equity)				0.071	0.034
				(0.690)	(0.420)
Return (t-2, t-12)				0.540**	0.551**
				(2.105)	(2.086)
Operating Profitability					0.117
					(1.385)
Investment					-0.246***
					(-3.445)
Operating Accruals					-0.871**
					(-2.281)
Net Stock Issuance					-0.696***
					(-3.307)
Return (t-1)					-1.895***
					(-3.982)
Illiquidity					-0.275**
					(-2.437)
Idiosyncratic Volatility					-4.677
					(-0.466)
Co-Skewness					0.000
					(0.084)
Idiosyncratic Skewness					-0.040
					(-1.536)
Avg. # of Stocks	3327	1739	1738	1704	1415
Avg. Adjusted R^2	0.002	0.003	0.006	0.04	0.07
# of Monthly Observations	341	341	341	341	341

Table 6: Double-Sorting Portfolios Based on Macro-Disagreement β and Volatility/Uncertainty β

This table reports independent double-sorting portfolio results based on the macro-disagreement beta, and the volatility beta with respect to (the month-to-month change of) VIX as well as uncertainty beta with respect to the macro uncertainty (Jurado, Ludvigson, and Ng (2014)) and economic policy uncertainty (Baker, Bloom, and Davis (2015)) factors. Volatility and uncertainty betas are estimated in the same way as macro-disagreement betas. (See Table 3 for details.) In Panel A, we first form 4 by 4 independent-sorting portfolios for U.S. individual stocks based on macro-disagreement beta and volatility/uncertainty beta and calculate the equal-weighted portfolio returns for these 16 portfolios. Then, for each of the four macro-disagreement beta ranking, we take the average return across the four volatility/uncertainty beta portfolios to obtain four quartiles differing in macro-disagreement beta. The macro-disagreement beta 4-1 is the return difference between quartile 4 and quartile 1. Column 1 to column 3 use the beta on VIX, JLN, and EPU factors, respectively. In Panel B, we form 2 by 2 independent-sorting portfolios for fixed-income assets based on macro-disagreement beta and volatility/uncertainty beta and follow the same procedure as in Panel A. We combine both corporate bonds and MBS to obtain an adequate number of assets in each portfolio for the fixed-income market.

A: U.S. Stocks (EW): Macro-Disagreement β and volatility/uncertainty β			
	VIX	JLN	EPU
Macro-Disagreement β - 1 (low)	0.697	0.633	0.631
	(2.289)	(2.133)	(2.083)
2	0.815	0.752	0.750
	(3.084)	(2.945)	(2.869)
3	0.871	0.815	0.812
	(3.370)	(3.279)	(3.174)
Macro-Disagreement β - 4 (high)	0.930	0.850	0.870
	(3.148)	(2.978)	(2.974)
Macro-Disageement β 4-1	0.233***	0.217***	0.239***
	(3.219)	(2.749)	(3.206)
FFC4 Alpha	0.250***	0.222**	0.246***
	(2.780)	(2.536)	(2.725)
B: U.S. Fixed-Income: Macro-Disagreement β and volatility/uncertainty β			
	VIX	JLN	EPU
Macro-Disagreement β - (low)	0.243	0.265	0.243
	(1.786)	(2.008)	(1.722)
Macro-Disagreement β - (high)	0.430	0.410	0.441
	(4.207)	(4.074)	(4.266)
Macro-Disagreement β high-low	0.187**	0.145**	0.198**
	(2.561)	(2.157)	(2.530)
VAL and MOM Alpha	0.187**	0.142**	0.190**
	(2.497)	(2.049)	(2.335)

Table 7: Fama-MacBeth Regressions Controlling for Volatility and Uncertainty β

This table presents results from Fama-MacBeth (1973) regressions of securities' realized excess returns in month *t* +1 on their factor betas as of month *t* . In addition to macro forecast dispersion and conensus factors, we control for exposures to volatility risk (the month-to-month change in CBOE Volatility Index (VIX)) as well as the macro uncertainty (Jurado, Ludvigson, and Ng (2014)) and economic policy uncertainty (Baker, Bloom, and Davis (2015)). The rolling-window beta estimation procedures are the same as those in Table 3. In Panel A, the dependent variable is CRSP common stocks' excess returns and all beta variables are quintile rankings; in Panel B, the dependent variable is Barclays corporate bond and mortgage indices' excess returns and all beta variables are quintile rankings. Intercepts are included in regressions but not reported. Regression coefficients are reported in percentage and Newey-West (1987) *t* -statistics are reported in parentheses.

Panel A: U.S. common stocks

	(1)	(2)	(3)	(4)	(5)	(6)
Macro-Disagreement β	0.072***	0.065***	0.056***	0.055***	0.060***	0.046**
	(3.256)	(3.036)	(2.946)	(2.779)	(3.024)	(2.567)
Consensus β		-0.008	-0.019	-0.014	-0.014	-0.021
		(-0.224)	(-0.517)	(-0.436)	(-0.407)	(-0.572)
Market β		0.030	0.010	0.038	0.034	0.028
		(0.641)	(0.211)	(0.868)	(0.753)	(0.581)
Volatility (VIX) β			-0.027			0.021
			(-0.420)			(0.785)
Uncertainty (JLN) β				0.008		0.000
				(0.213)		(-0.004)
Uncertainty (EPU) β					0.023	-0.026
					(0.614)	(-0.413)
Avg. # of Stocks	3327	3327	3331	3327	3328	3331
Avg. Adjusted R^2	0.00	0.01	0.02	0.02	0.02	0.02
# of Time-Series Obs.	341	341	323	341	335	323

Panel B: U.S. fixed-income assets

	(1)	(2)	(5)	(4)	(3)	(6)
Macro-Disagreement β	0.089***	0.070***	0.061**	0.052**	0.058**	0.051*
	(2.734)	(2.697)	(2.481)	(1.981)	(2.245)	(1.779)
Consensus β		0.018	0.009	0.007	0.048*	0.041
		(0.540)	(0.255)	(0.208)	(1.747)	(1.425)
Market β		0.016	0.063	0.077*	-0.002	0.098*
		(0.343)	(1.161)	(1.792)	(-0.025)	(1.887)
Volatility (VIX) β			0.048			-0.023
			(1.303)			(-0.579)
Uncertainty (JLN) β				0.059*		0.064*
				(1.671)		(1.711)
Uncertainty (EPU) β					-0.001	0.053
					(-0.017)	(1.576)
Avg. # of Assets	28	28	28	28	28	28
Avg. Adjusted R^2	0.157	0.382	0.412	0.45	0.445	0.491
# of Time-Series Obs.	341	341	323	341	335	323

Table 8: Macro-Disagreement β Portfolios of International Asset Markets

This table presents monthly mean excess returns (in percent) and Newey-West t-statistics (in parentheses) of portfolios formed on macro-disagreement β in three international asset markets. A security's macro-disagreement β is obtained by monthly regressing its excess returns on the change in macro-disagreement measure ΔDisagree, controlling for the market factor and change in macro forecast consensus ΔConsensus. We use 36-month rolling-window regressions and require 24 months of observations for performing the estimation. We construct four quartile portfolios and hold the portfolios for a month. We calculate equal-weighted (EW) portfolio returns. The first portfolio formation months are 07/1986, 12/1986, and 04/1993, respectively, while the last portfolio formation month is 11/2014 for all. We also report abnormal returns adjusted for global market excess return, and the value and momentum factors of Asness, Moskowitz, and Pedersen (2013) for each specific asset class (VAL and MOM), obtained from the AQR data library.

Macro-Disagreement β Portfolio	International Equity Index	Foreign Currency	International Sovereign Bond Futures
1 (Low)	0.335	0.184	0.121
	(1.381)	(1.172)	(1.162)
2	0.692	0.202	0.044
	(2.732)	(1.359)	(0.695)
3	0.551	0.192	0.008
	(2.248)	(1.298)	(0.126)
4 (High)	0.525	0.171	0.137
	(1.966)	(1.293)	(1.689)
High-Low	0.19	-0.012	0.016
	(1.305)	(-0.089)	(0.163)
VAL and MOM Alpha	0.155	-0.081	-0.035
	(1.008)	(-0.563)	(-0.355)

Table 9: Macro-Disagreement β Portfolios Based on Alternative Macro Variables

We construct macroeconomic forecast consensus and dispersion factors using various macro variables in the surveys of Blue Chip Economic Indicators (BCEI). In the first four specifications, we use real GDP growth (RGDP), industrial production growth (IP), unemployment rate (UNEMP), and real non-residential fixed investment (INV) separately. The first order difference of each variable is used. In the last specification, we construct the simple average of the first order difference of a larger set of macro variables, including RGDP, IP, UNEMP, INV, consumer price index (CPI), and pre-tax corporate profits (CORP). This table presents monthly mean excess returns (in percent) and Newey-West t-statistics (in parentheses) of portfolios formed on security's beta with respect to change in macroeconomic forecast dispersion. (See details of beta estimation and portfolio formation in Table 3.) In the U.S. common stock sample, we form ten deciles on macro-disagreement beta; and in other samples (corporate bond, MBS, and all fixed income securities), we form four portfolios. For brevity, we only present results of two extreme portfolios as well as long-short hedge portfolios.

A: Macro-Disagreement β Portfolios Based on Individual Macro Variables					
Macro-Disagreement β portfolio	US Stocks (EW)	US Stocks (VW)	Corp	MBS	All Fixed Income
(a) Real GDP Growth (RGDP)					
Low	0.549	0.497	0.284	0.398	0.316
	(1.627)	(1.390)	(1.643)	(2.386)	(1.880)
High	0.759	0.927	0.494	0.062	0.307
	(2.187)	(2.332)	(3.499)	(0.331)	(2.221)
High-Low	0.21	0.429*	0.21	-0.336***	-0.009
	(1.469)	(1.915)	(1.293)	(-3.204)	(-0.081)
(b) Industrial Production Growth (IP)					
Low	0.454	0.163	0.27	0.121	0.143
	(1.247)	(0.400)	(1.493)	(0.585)	(0.772)
High	0.857	1.138	0.562	0.394	0.487
	(2.620)	(2.962)	(4.633)	(3.483)	(4.575)
High-Low	0.403***	0.975***	0.292*	0.273*	0.344**
	(2.628)	(3.703)	(1.942)	(1.705)	(2.447)
(c) Unemployment (UNEMP)					
Low	0.616	0.69	0.296	0.162	0.223
	(1.898)	(2.079)	(1.779)	(0.893)	(1.153)
High	0.695	0.768	0.469	0.358	0.438
	(1.840)	(1.683)	(3.445)	(3.237)	(3.849)
High-Low	0.08	0.078	0.173	0.196	0.215
	(0.489)	(0.292)	(1.189)	(1.386)	(1.270)
(d) Non-Residential Fixed Investment (INV)					
Low	0.479	0.381	0.183	0.195	0.184
	(1.378)	(1.085)	(1.286)	(1.071)	(1.193)
High	0.84	0.95	0.589	0.267	0.486
	(2.498)	(2.631)	(3.425)	(1.489)	(3.390)
High-Low	0.361***	0.569***	0.406**	0.072	0.302***
	(3.890)	(2.769)	(2.561)	(0.666)	(2.669)
B: Macro-Disagreement β Portfolios Based on six macro variables: RGDP, IP, UNEMP, INV, CPI, and CORP					
Low	0.442	0.418	0.272	0.225	0.214
	(1.279)	(1.060)	(1.602)	(1.085)	(1.193)
High	0.832	0.986	0.565	0.212	0.432
	(2.451)	(2.578)	(4.047)	(1.599)	(3.688)
High-Low	0.390***	0.568**	0.294*	-0.012	0.218
	(2.752)	(2.398)	(1.919)	(-0.105)	(1.528)

Table 10: Alternative Constructions of Macro-Disagreement

We construct three alternative forecast dispersion measures to proxy for macro-disagreement. In Panel A, we construct the forecast dispersion measure as top-minus-bottom ten averages. At each point of time, we sort all individual analysts' macro forecasts from low to high, calculate the average over the bottom ten forecasts and also the average over the top ten forecasts, and take the difference between these two averages. In Panel B, we construct the shock in forecast dispersion as the average of the AR(1) residual for each macro variable. In Panel C, we construct the forecast dispersion measure as the first principal component of the four macro variables. This table presents monthly mean excess returns (in percent) and Newey-West *t* -statistics (in parentheses) of portfolios formed on security's beta with respect to the shock in macroeconomic forecast dispersion. (See details of beta estimation and portfolio formation in Table 3.) For U.S. common stocks, we form ten deciles on macro-disagreement beta; and for fixed-income assets, we form four portfolios. For brevity, we only present results of two extreme portfolios as well as long-short hedge portfolios.

Macro-Disagreement β portfolio	US Stocks (EW)	US Stocks (VW)	Corp	MBS	All Fixed Income
A: Top Minus Bottom					
Low	0.416	0.134	0.23	0.191	0.156
	(1.174)	(0.356)	(1.366)	(1.007)	(0.890)
High	0.922	1.015	0.562	0.309	0.494
	(2.651)	(2.621)	(4.045)	(2.130)	(3.818)
High-Low	0.506***	0.881***	0.331**	0.119	0.338***
	(3.855)	(3.930)	(2.240)	(1.206)	(2.796)
B: AR(1)					
Low	0.406	0.272	0.196	0.143	0.094
	(1.122)	(0.719)	(1.111)	(0.682)	(0.449)
High	0.839	0.861	0.521	0.432	0.457
	(2.436)	(2.338)	(3.690)	(4.721)	(4.127)
High-Low	0.433***	0.589***	0.326*	0.288	0.363*
	(2.786)	(2.891)	(1.914)	(1.519)	(1.796)
C: Principal Component					
Low	0.474	0.18	0.302	0.163	0.18
	(1.319)	(0.469)	(1.756)	(0.854)	(0.916)
High	0.873	0.806	0.533	0.416	0.477
	(2.532)	(2.111)	(4.002)	(4.114)	(4.363)
High-Low	0.399***	0.626***	0.231	0.252*	0.296*
	(3.151)	(3.814)	(1.542)	(1.708)	(1.804)

Table 11: Monthly returns of portfolios sorted by macro-disagreement β

This table presents monthly mean excess returns (in percent) and Newey-West t-statistics (in parentheses) of portfolios formed on macro-disagreement β in U.S. individual stocks. We form industry-neutral decile portfolios using the Fama-French 12-industry classifications. A security's macro-disagreement β is obtained by monthly regressing its excess returns on the change in macro-disagreement measure ΔDisagree, controlling for the market factor and change in macro forecast consensus ΔConsensus. We use 36-month rolling-window regressions and require 24 months of observations for performing the estimation. We hold the portfolios for a month and calculate both equal-weighted (EW) and value-weighted (VW) portfolio returns. The portfolio formation period is from 07/1986 to 11/2014. We also report abnormal returns adjusted for the Fama and French (1993) and Carhart (1997) four factors (FFC4) for individual stocks.

Macro-Disagreement β portfolio	US Stocks EW (Industry Neutral)		US Stocks VW (Industry Neutral)	
	Excess Return	FFC4 Alpha	Excess Return	FFC4 Alpha
1(Low)	0.479	-0.248	0.324	-0.374
	(1.378)	(-3.392)	(1.025)	(-3.271)
2	0.73	0.041	0.499	-0.164
	(2.363)	(0.720)	(1.728)	(-1.761)
3	0.731	0.036	0.619	-0.014
	(2.564)	(0.677)	(2.426)	(-0.177)
4	0.779	0.111	0.53	-0.141
	(2.785)	(1.900)	(1.991)	(-1.741)
5	0.756	0.108	0.696	0.08
	(2.798)	(1.926)	(2.942)	(1.090)
6	0.779	0.123	0.641	0.011
	(2.891)	(2.008)	(2.456)	(0.128)
7	0.869	0.221	0.73	0.132
	(3.250)	(3.363)	(2.860)	(2.158)
8	0.78	0.112	0.699	0.075
	(2.809)	(1.806)	(2.773)	(0.879)
9	0.866	0.14	0.752	0.053
	(2.874)	(2.318)	(2.575)	(0.563)
10(High)	0.87	0.116	1.081	0.281
	(2.575)	(1.417)	(3.290)	(1.920)
High-Low	0.391***	0.364***	0.758***	0.655***
	(3.889)	(3.566)	(3.956)	(3.384)

Table 12: Macro-disagreement β portfolios at different portfolio formation frequencies

This table presents monthly mean excess returns (in percent) and Newey-West *t* -statistics (in parentheses) of macro-disagreement beta portfolios formed at quarterly, semi-annual, and annual frequencies. (See details of beta estimation and portfolio formation in Table 3.) Panel A consists of the sample of U.S. common stocks, and Panel B consists of samples of U.S. fixed income assets. Both equal-weighted and value-weighted results are reported for individual stocks, while equal-weighted results are reported for fixed income assets (corporate bond, MBS, and all fixed-income assets).

Panel A: U.S. common stocks

Macro-Disagreement β portfolio	Quarterly Formation		Semi-annual Formation		Annual Formation	
	EW	VW	EW	VW	EW	VW
1(Low)	0.419	0.242	0.453	0.33	0.533	0.515
	(1.223)	(0.643)	(1.331)	(0.852)	(1.590)	(1.383)
2	0.651	0.325	0.649	0.374	0.681	0.426
	(2.304)	(1.026)	(2.239)	(1.163)	(2.328)	(1.352)
3	0.714	0.558	0.753	0.481	0.745	0.476
	(2.737)	(2.254)	(2.876)	(1.892)	(2.837)	(1.846)
4	0.773	0.684	0.759	0.675	0.767	0.635
	(2.947)	(2.767)	(2.954)	(2.686)	(2.988)	(2.663)
5	0.739	0.547	0.775	0.578	0.799	0.571
	(3.015)	(2.313)	(3.096)	(2.365)	(3.160)	(2.241)
6	0.846	0.794	0.848	0.786	0.835	0.733
	(3.519)	(3.324)	(3.614)	(3.362)	(3.480)	(3.014)
7	0.84	0.635	0.774	0.645	0.795	0.658
	(3.449)	(2.549)	(3.036)	(2.705)	(3.121)	(2.649)
8	0.843	0.749	0.859	0.739	0.812	0.784
	(3.157)	(3.043)	(3.314)	(3.100)	(3.125)	(3.372)
9	0.957	0.848	0.94	0.836	0.891	0.767
	(3.438)	(2.902)	(3.449)	(2.863)	(3.326)	(2.738)
10(High)	0.897	1.039	0.872	1.037	0.864	1.035
	(2.603)	(2.926)	(2.616)	(3.023)	(2.584)	(2.905)
High-Low	0.478***	0.797***	0.420***	0.707***	0.331***	0.520**
	(3.389)	(3.324)	(3.612)	(3.085)	(2.881)	(2.274)
FFC4 Alpha	0.397***	0.708***	0.314***	0.542**	0.228**	0.346
	(2.891)	(2.711)	(2.648)	(2.281)	(2.170)	(1.632)

Panel B: fixed income securities (corporate bonds, MBS, all fixed income)

Macro-Disagreement β portfolio	Quarterly Formation			Semi-annual Formation			Annual Formation		
	Corporate Bond	MBS	All Fixed Income	Corporate Bond	MBS	All Fixed Income	Corporate Bond	MBS	All Fixed Income
1 - Low	0.258	0.118	0.114	0.280	0.086	0.114	0.240	0.064	0.070
	(1.941)	(0.662)	(0.700)	(2.040)	(0.413)	(0.640)	(1.632)	(0.296)	(0.377)
2	0.285	0.205	0.283	0.277	0.193	0.252	0.333	0.253	0.283
	(2.868)	(1.733)	(3.144)	(2.171)	(1.323)	(2.501)	(2.491)	(1.673)	(2.842)
3	0.451	0.346	0.373	0.421	0.330	0.372	0.402	0.327	0.366
	(3.841)	(4.328)	(4.995)	(4.550)	(3.965)	(5.161)	(4.609)	(3.876)	(5.230)
4 - High	0.499	0.418	0.511	0.515	0.468	0.537	0.515	0.455	0.555
	(4.231)	(3.504)	(4.554)	(4.339)	(5.165)	(5.107)	(4.580)	(5.934)	(5.519)
High - Low	0.241*	0.299**	0.397***	0.235*	0.383**	0.423***	0.275*	0.392**	0.484***
	(1.914)	(2.459)	(3.148)	(1.754)	(2.060)	(2.617)	(1.893)	(1.988)	(2.856)
VAL and MOM Alpha	0.215	0.339**	0.376***	0.215	0.411**	0.409**	0.282*	0.430**	0.474***
	(1.645)	(2.478)	(2.879)	(1.573)	(2.252)	(2.589)	(1.926)	(2.217)	(2.828)

Table A1: Characteristics of assets in each macro-disagreement portfolio

This table presents the characteristics of assets. For each variable, time-series average of the cross-sectional median value is reported for each macro-disagreement beta portfolio. Panel A consists of the sample of U.S. common stocks, and the variables include (log) market equity and book-to-market equity (Fama and French, 1992), past 12-month return (Jegadeesh and Titman, 1993), operating profitability and investment (Fama and French, 2015), operating accruals (Sloan, 1996), net stock issuance (Fama and French, 2008), past one-month return (Jegadeesh, 1990), Amihud's illiquidity (Amihud, 2002), idiosyncratic return volatility (Ang et al., 2006), systematic skewness (Harvey and Siddique, 2000), and idiosyncratic skewness (Bali, Cakici, and Whitelaw, 2011). Panel B consists of samples of U.S. fixed income assets, and the variables are disagreement beta, consensus beta, market beta, credit rating, and maturity. The last two rows in each panel report the difference between the high and low macro-disagreement portfolios, and New-West t-statistics are reported in parentheses.

Panel A: Characteristics of Macro-Disagreement Portfolios in US Stocks

Disagreement β Decile	Disagreement β	logME	BM	Return (t-2, t-12)	Operating Profitability	Investment	Accruals	Net Stock Issuance	Return (t-1)	Illiquidity	CoSkew	IdioSkew
1	-0.385	5.394	0.494	0.136	0.189	0.111	0.016	0.011	0.112	0.032	-5.032	0.447
2	-0.208	5.707	0.585	0.104	0.223	0.09	0.007	0.008	0.072	0.025	-3.029	0.328
3	-0.129	5.87	0.622	0.103	0.229	0.083	0.005	0.008	0.064	0.022	-2.299	0.31
4	-0.073	5.943	0.632	0.102	0.233	0.079	0.004	0.007	0.063	0.02	-1.951	0.288
5	-0.027	5.992	0.638	0.102	0.235	0.077	0.004	0.008	0.06	0.02	-1.972	0.277
6	0.017	6.01	0.639	0.105	0.233	0.075	0.004	0.008	0.056	0.02	-1.837	0.278
7	0.062	6.008	0.638	0.108	0.232	0.076	0.004	0.007	0.055	0.02	-1.828	0.286
8	0.118	5.935	0.626	0.111	0.231	0.079	0.005	0.009	0.059	0.022	-2.014	0.303
9	0.199	5.715	0.616	0.119	0.226	0.082	0.006	0.01	0.081	0.024	-2.786	0.336
10	0.38	5.302	0.557	0.165	0.199	0.095	0.011	0.014	0.131	0.031	-4.329	0.451
High-Low	0.765***	-0.092	0.063***	0.029	0.009	-0.016**	-0.005**	0.003	0.019	-0.001	0.703	0.005
	(15.759)	(-1.428)	(3.172)	(1.260)	(1.005)	(-2.075)	(-2.030)	(0.997)	(0.897)	(-1.355)	(1.120)	(0.219)

Panel B: Characteristics of Macro-Disagreement Portfolios in US Fixed-Income Markets

Disagreement β Decile	Disagreement β	Consensus β	Market β	Rating	Maturity
1	-0.029	0.003	0.178	2.72	20.581
2	-0.012	0.001	0.118	3.743	16.737
3	-0.001	0.001	0.131	3.978	16.729
4	0.012	0.001	0.224	2.774	20.139
High-Low	0.041***	-0.002	0.046	0.054	-0.442
	(10.123)	(-1.334)	(1.169)	(0.132)	(-0.302)

Table A2: Transition matrix

This table reports the average portfolio transition matrix in one, three, six, and twelve months ahead. The table presents the average probability that a stock in decile i (defined by the rows) in one month will be in decile j (defined by the columns) in the next one, three, six, or twelve months. Panel A reports the result for U.S. individual stocks, and Panel B reports the results for fixed-income assets.

A: U.S. Stocks (EW): Macro-Disagreement β Decile Transition Probability											
Forward 1m											
Decile	1	2	3	4	5	6	7	8	9	10	total
1	87.92	9.87	1.11	0.41	0.21	0.14	0.11	0.09	0.09	0.06	100.00
2	9.26	72.55	13.96	2.23	0.85	0.43	0.29	0.20	0.12	0.10	100.00
3	1.03	13.61	64.36	15.68	3.01	1.16	0.56	0.31	0.18	0.10	100.00
4	0.39	2.19	15.45	59.83	16.52	3.38	1.21	0.59	0.30	0.13	100.00
5	0.19	0.84	3.01	16.37	57.87	16.55	3.38	1.18	0.46	0.15	100.00
6	0.14	0.45	1.12	3.43	16.74	57.80	16.22	2.97	0.88	0.24	100.00
7	0.10	0.29	0.58	1.24	3.33	16.52	59.87	15.38	2.29	0.40	100.00
8	0.07	0.21	0.32	0.58	1.11	3.04	15.76	64.37	13.47	1.07	100.00
9	0.09	0.14	0.19	0.29	0.45	0.93	2.36	14.12	72.36	9.06	100.00
10	0.08	0.11	0.10	0.15	0.18	0.28	0.43	1.04	9.87	87.77	100.00
Forward 3m											
Decile	1	2	3	4	5	6	7	8	9	10	total
1	76.00	16.37	3.46	1.39	0.80	0.57	0.47	0.37	0.33	0.25	100.00
2	14.81	52.65	19.70	5.99	2.74	1.49	1.02	0.76	0.51	0.34	100.00
3	3.06	19.20	42.90	20.04	7.13	3.50	1.88	1.23	0.69	0.38	100.00
4	1.31	5.61	20.03	38.39	20.00	7.73	3.52	1.93	1.03	0.45	100.00
5	0.71	2.60	7.05	19.92	36.79	19.76	7.63	3.46	1.53	0.55	100.00
6	0.53	1.55	3.34	7.76	19.96	36.62	19.74	6.93	2.75	0.82	100.00
7	0.39	0.99	1.83	3.67	7.77	20.21	38.54	19.43	5.84	1.34	100.00
8	0.34	0.76	1.13	1.88	3.39	7.14	20.32	43.35	18.56	3.13	100.00
9	0.34	0.55	0.73	1.07	1.53	2.76	6.12	19.80	52.84	14.27	100.00
10	0.34	0.40	0.44	0.58	0.68	0.94	1.48	3.28	16.05	75.80	100.00

Forward 6m

Decile	1	2	3	4	5	6	7	8	9	10	total
1	63.69	19.81	6.50	3.06	1.94	1.35	1.18	0.95	0.85	0.69	100.00
2	17.52	38.39	20.40	9.31	5.10	3.24	2.30	1.69	1.20	0.86	100.00
3	5.30	19.82	30.20	19.49	10.20	5.93	3.79	2.70	1.68	0.89	100.00
4	2.65	8.76	19.15	26.37	19.01	10.64	6.18	3.84	2.35	1.06	100.00
5	1.67	4.83	10.06	18.84	25.26	18.40	10.49	5.98	3.17	1.30	100.00
6	1.22	3.09	5.79	10.59	18.67	25.34	18.59	9.76	5.10	1.84	100.00
7	0.98	2.16	3.77	6.15	10.65	19.27	26.58	18.84	8.80	2.81	100.00
8	0.81	1.71	2.46	3.86	6.04	10.18	19.89	30.30	19.20	5.55	100.00
9	0.79	1.35	1.74	2.35	3.33	5.13	9.49	20.97	38.51	16.34	100.00
10	0.87	1.05	1.18	1.38	1.54	2.07	3.19	6.03	19.29	63.40	100.00

Forward 12m

Decile	1	2	3	4	5	6	7	8	9	10	total
1	47.05	20.41	9.96	5.81	3.96	3.14	2.85	2.52	2.31	1.99	100.00
2	17.36	25.19	17.81	11.95	7.96	5.93	4.66	3.86	3.09	2.18	100.00
3	7.84	17.43	19.72	16.27	12.17	8.82	6.48	5.21	3.85	2.21	100.00
4	4.53	10.83	16.28	17.98	15.46	12.10	9.18	6.61	4.49	2.54	100.00
5	3.21	7.48	11.99	15.72	17.16	15.50	11.96	8.42	5.68	2.88	100.00
6	2.65	5.47	8.31	11.82	15.85	17.53	15.43	11.84	7.64	3.47	100.00
7	2.31	4.40	6.47	8.79	12.29	16.08	18.29	15.81	10.74	4.82	100.00
8	2.09	3.75	4.85	6.68	9.15	12.06	16.73	20.14	16.60	7.95	100.00
9	2.04	3.20	3.94	4.76	6.08	8.11	11.79	18.34	25.67	16.07	100.00
10	2.40	2.76	2.93	3.07	3.38	4.29	5.85	9.48	19.92	45.92	100.00

B: Fixed Income Macro-Disagreement β Quartile Transition Probability					
Forward 1m					
Quartile	1	2	3	4	total
1	87.96	9.35	1.50	1.19	100.00
2	9.09	76.59	12.52	1.80	100.00
3	1.52	11.92	72.76	13.79	100.00
4	0.95	2.34	12.00	84.70	100.00
Forward 3m					
Quartile	1	2	3	4	total
1	76.80	14.80	3.87	4.53	100.00
2	14.56	61.71	18.45	5.27	100.00
3	3.95	18.64	57.89	19.52	100.00
4	3.60	5.13	17.98	73.29	100.00
Forward 6m					
Quartile	1	2	3	4	total
1	64.73	18.04	7.60	9.63	100.00
2	18.98	49.72	20.64	10.67	100.00
3	7.32	23.12	47.80	21.75	100.00
4	7.13	9.16	22.09	61.61	100.00
Forward 12m					
Quartile	1	2	3	4	total
1	52.70	17.66	11.66	17.98	100.00
2	22.97	40.84	22.70	13.48	100.00
3	11.37	26.47	37.84	24.33	100.00
4	10.51	14.29	25.59	49.61	100.00